

Predict the Inflation of Food Prices based on the Linear Regression Models

Xuanmo Chen *

University of California Davis, Davis, US

* Corresponding author: thch@ucdavis.edu

Abstract. Using the large "Global Food Price Inflation" dataset from Kaggle, this paper provides a thorough analysis of food price inflation in Cameroon. In the framework of Cameroon's dynamic economy, the research focuses on comprehending the complex financial indicators and their relationship to trends in food prices between 2015 and 2017. The study addresses the crucial role that agriculture plays in Cameroon's economy by using both polynomial and linear regression models to analyze and forecast food inflation rates. Because of its simple methodology, the linear regression model works better for making short-term predictions because it can capture the main inflation rate trend without getting bogged down in the details of capturing small variations in the data. Conversely, polynomial regression tends to overfit in this situation even though it is skilled at simulating non-linear relationships. The study's conclusions emphasize how crucial it is to select the right model for economic forecasting and stress the value of clarity and simplicity in identifying key economic trends, particularly in short-term scenarios. This research adds significant knowledge to the field of economic analysis and forecasting methodology; it is especially pertinent to policymakers, economists, and researchers who specialize in developing economies.

Keywords: Food Price Inflation, Regression Analysis, Economic Forecasting.

1. Introduction

Understanding the complexities and interdependencies of the global economy offers a multitude of opportunities and challenges when it comes to financial market trends and fluctuations. The inflation of food prices, a critical sign of the health and stability of the economy, is at the center of these dynamics. As demonstrated by historical data from the US Inflation Calculator, food inflation has shown fluctuating trends over the decades, underscoring the importance of understanding this phenomenon in diverse economic contexts [1]. In-depth empirical research on the inflation of food prices is presented in this paper, with particular attention to Cameroon's dynamic and changing economy. This study intends to provide a deeper understanding of the economic factors influencing food price trends in Cameroon and to develop trustworthy predictive models for policy guidance and economic strategy formulation. It does this by utilizing the extensive dataset from "Global Food Price Inflation" that is available on Kaggle. While global agricultural food commodity prices have shown a decline, as highlighted by the International Food Policy Research Institute, the domestic food inflation in low- and middle-income countries continues to rise, signaling a disparity between global market trends and local consumer prices [2].

The present investigation explores the intricacies of financial indicators, namely Open, High, Low, and Close values. These indicators are conventionally employed in stock market evaluations, but they are also utilized to scrutinize the subtleties of food price inflation. Examining these measures in conjunction with inflation rates helps us understand the state of the economy as a whole, with a particular emphasis on Cameroon's special place in the world economy. The well-structured and detailed dataset provides a wealth of information for economic forecasting and comparison, enabling a thorough examination of both national and global trends.

This research uses both linear and polynomial regression models to predict food inflation rates because of the critical role that agriculture plays in Cameroon's economy and the substantial influence that food prices have on the country's overall economic health. These models were selected because they can explain how time and inflation rates relate to one another and provide insights into both

possible long-term economic trajectories and short-term trends. Therefore, the study makes its way between polynomial complexity and linear simplicity to distill the essence of Cameroon's economic pulse.

Our research, which focuses on the years 2015 to 2017, offers important new information about how well various modeling techniques predict trends in food inflation. As this study indicates, selecting the right model is essential to guaranteeing relevance and accuracy in economic forecasting. This paper adds to the larger discussion on economic analysis methodologies, especially in the context of developing economies, by contrasting the benefits and drawbacks of linear and polynomial regression models.

In conclusion, this work adds to the methodological discussion in economic forecasting and offers a thorough analysis of Cameroon's inflation of food prices. It is well-positioned to be useful for researchers, economists, and decision-makers who want to comprehend and forecast the economic trends in quickly changing markets like Cameroon.

2. Predict the Inflation of Food Prices based on the Linear Regression Models

2.1. Data Profile

My analysis is based on the dataset chosen from “Global Food Price Inflation” (Kaggle). The dataset offers a detailed and extensive examination of financial indicators across a diverse range of countries. It encompasses essential financial metrics, including Open, High, Low, and Close values, which are fundamental components in the realm of financial data analysis. These metrics are typically used to track the performance of stock prices or other financial indices, providing a snapshot of market behavior and trends. The inclusion of such data is instrumental in understanding the fluctuations and dynamics of financial markets on a global scale. A comprehensive analysis in The BMJ on the effect of rising food prices on food consumption reveals significant changes in consumer behavior. This systematic review with meta-regression illustrates the nuanced ways in which different food groups' demand responds to price changes, emphasizing the complex relationship between food inflation and consumer choices [3].

In addition to these key financial metrics, the dataset also provides valuable information on the inflation rates for each country. This aspect of the dataset is particularly significant as it sheds light on the economic stability and the variations in price levels over time. Inflation rates are crucial economic indicators, as they reflect the rate at which the general level of prices for goods and services is rising, and, subsequently, how that rise erodes the purchasing power of money. The ability to track inflation rates is essential for assessing economic health and making informed policy decisions. The alarming impact of food inflation on child undernutrition, especially in low and middle-income countries, as reported in a study by IFPRI published in Nature Communications, underscores a critical public health concern. The research highlights the heightened risks of wasting and severe wasting among preschool children due to food price rises, calling for urgent policy interventions [4].

The organization of the data is meticulously structured concerning individual countries. Each entry is identified by the country's name and its corresponding three-letter ISO code, ensuring ease of identification and analysis. This level of organization is vital for comparative studies and for tracking economic trends on both a national and international scale. Furthermore, each data point is time-stamped, providing the specific date of the data entry. This temporal aspect allows for a chronological analysis, enabling the study of financial trends over time and the identification of historical patterns and anomalies.

The value of this dataset lies in its comprehensive nature and the breadth of its coverage. It is a powerful tool for conducting economic analysis, particularly in tracking and understanding the trends in financial markets and inflationary patterns across various nations. Economists, financial analysts, policymakers, and researchers can leverage this dataset to gain insights into the economic climate of different countries, compare financial trends across regions, and make forecasts based on historical data. In a world where economies are increasingly interconnected, such a dataset becomes

indispensable for global economic analysis and for understanding the complex dynamics of the international financial landscape.

2.2. Model Introduction and Variable Setting

In the context of predicting food inflation in Cameroon, a country with a dynamic and rapidly evolving economy, I have chosen regression analysis as a key analytical method from the “Global Food Price Inflation” dataset available on Kaggle. This choice is underpinned by the need to understand and forecast economic trends in a nation that, despite its challenges, is experiencing significant growth and transformation. The study employs linear and polynomial regression models to forecast food inflation rates using data from the years 2015, 2016, and 2017. These models are pivotal for dissecting the complex dynamics of Cameroon's economy, where agriculture plays a crucial role, and food prices are a critical indicator of overall economic health.

Linear regression is particularly suited for this task due to its straightforward approach and effectiveness in handling time-series data. This model assumes a linear relationship between time and inflation rates, making it particularly effective for short-term predictions in an environment like Cameroon's, where the economic conditions and policies are relatively stable in the short run. The strength of the linear model lies in its ability to provide clear, concise insights into the direction and velocity of inflation trends, with time as an independent variable and the inflation rate as the dependent variable. This simplicity makes it an invaluable tool for policymakers and economists who require quick and accurate forecasts to make informed decisions.

Polynomial regression, on the other hand, is utilized to account for potential non-linear patterns in the inflation rate, which are often observed in rapidly developing economies like Cameroon. This type of regression is adept at handling the curvature in the data that might arise due to various economic factors. These include seasonal variations in food prices, influenced by agricultural cycles, changes in consumer behavior, and unexpected shocks to the supply chain, such as natural disasters or global market fluctuations. By fitting a polynomial curve to the inflation data, the model is capable of uncovering more intricate relationships and patterns that a linear approach might overlook, providing a more nuanced understanding of the inflation dynamics in Cameroon.

The application of regression analysis in this context is particularly effective for short-term predictions because it leverages the stability and predictability of recent trends, which are more pronounced shortly. This method is especially advantageous when utilizing current and relevant data from a specific period, as it can accurately reflect the immediate economic conditions in Cameroon. Short-term forecasts, like those for food inflation rates, are less likely to encounter the complex and unpredictable factors that typically influence long-term scenarios. This reduces the risk of inaccuracies in the model. Furthermore, in a short-term context, regression models are less susceptible to overfitting, as they do not need to account for the broader fluctuations and anomalies that occur over longer periods. Therefore, for making predictions about food inflation rates, particularly in a dynamic and evolving economy like Cameroon's, regression analysis offers a reliable, straightforward, and highly applicable approach.

2.3. Interpretation of Result

The analysis of food inflation rates in Cameroon, focusing on the years 2015 to 2017, has revealed some intriguing findings. During this period, linear regression emerged as a more effective tool than polynomial regression for predicting short-term food inflation trends. This outcome can be primarily attributed to the inherent characteristics of the linear model. Unlike its polynomial counterpart, the linear model excels in capturing the fundamental trend of the data in a straightforward and uncomplicated manner. This simplicity is crucial in contexts where the overarching trend is more significant than the finer details of data variation.

On the other hand, polynomial regression, known for its ability to model complex and non-linear relationships, tends to overfit in this specific scenario. Overfitting is a phenomenon where a model becomes excessively attuned to the minor fluctuations and noise in the historical data, at the expense

of its ability to generalize to new, unseen data. In the case of short-term food inflation forecasting in Cameroon, this tendency to overfit renders polynomial regression less effective. The minor anomalies and fluctuations in the data, which polynomial regression might pick up, do not necessarily contribute to a more accurate prediction of future trends in this context. An Oxford Academic article explores the macroeconomic effects of global food price shocks, particularly focusing on how these shocks influence domestic inflation. This study provides valuable insights into the transmission mechanisms of global price changes to local economies, a factor crucial for countries like Cameroon [5].

The linear model's strength, therefore, lies in its robustness and generalizability. Its predictions are not only more aligned with the primary trend but are also more applicable to unseen data. This finding is particularly pertinent for policymakers and analysts in Cameroon, highlighting the importance of choosing the right model based on the specific forecasting requirements. In economic forecasting, where the primary objective is often to identify and follow the prevailing trend, the simplicity and directness of the linear model make it a more suitable choice. This study underscores the principle that in the realm of short-term economic forecasting, a model's ability to capture the essential trend straightforwardly often outweighs the benefits of capturing complex data variations. Highlighting the health implications in developing economies, another Oxford Academic study examines the relationship between high food inflation and malnutrition. The findings, based on data from the Ethiopian Demographic and Health Survey, contribute to understanding the broader societal impacts of food price inflation, which is particularly relevant for Cameroon's policy framework [6].

3. Conclusion

The analysis of the inflation of food prices in Cameroon between 2015 and 2017 highlights how important it is to choose the right model for economic forecasting. Because linear regression can directly capture the underlying data trend, it has proven to be a more effective tool for forecasting short-term trends in food inflation. This clarity and directness are crucial in situations where the overall trend is more important than small fluctuations in the data. Conversely, the overfitting vulnerability of polynomial regression, although valuable for simulating intricate relationships, was less successful in this particular context of short-term forecasting.

For policymakers and analysts, the linear model's generalizability and robustness are ideal, especially when it comes to short-term economic forecasting. This study shows that the ability of a model to simply capture the important trend is frequently more useful in economic analysis than the ability to capture complex variations in data, particularly in dynamic and evolving economies such as Cameroon. In addition to contributing to the body of knowledge in economic forecasting, this study offers useful guidance for individuals developing economic strategies and policies in quickly evolving markets. Future economic analyses and decision-making procedures will greatly benefit from the knowledge gathered from this study, particularly when it comes to developing economies where precise and timely forecasts are essential.

References

- [1] U.S. Inflation Calculator. Food Inflation in the United States (1968-2023). 2022.
- [2] International Food Policy Research Institute. Despite improved global market conditions, high food price inflation persists. IFPRI. 2023.
- [3] Green, R., Cornelsen, L., Dangour, A. D., Turner, R., Shankar, B., Mazzocchi, M., & Smith, R. D. The effect of rising food prices on food consumption: systematic review with meta-regression. (2016).
- [4] Headey, D., & Ruel, M. Food inflation and child undernutrition in low and middle-income countries. *Nature Communications*, 2023, 14 (1), 5761.
- [5] Davide Furceri, Prakash Loungani, John Simon, Susan M. Wachter, Global food prices and domestic inflation: some cross-country evidence, *Oxford Economic Papers*, 2016, 68 (3), 665 – 687.

- [6] Andinet Woldemichael, Daniel Kidane, Abebe Shimeles, Food Inflation and Child Health, The World Bank Economic Review, 2022, 36 (3), 757 - 773.