The Social Science Review A Multidisciplinary Journal. January-February, 2025. Vol. 3. Issue 1. 97-100

Published by: Pather Dabi Educational Trust, (Regn No: IV-1402-00064/2023), Under Govt. of West Bengal, India

The Social Science Review
A Multidisciplinary Journal
ISSN: 2584-0789
(Open-Access, Peer-Reviewed, Refereed, Bi-Monthly, International e-Journal)
Homepage: www.tssreview.in

THE IMPACT OF INFLATION ON GDP GROWTH: AN ANALYSIS USING ORDINARY LEAST SQUARES (OLS)

Vanthoch SOTH

RESEARCH ARTICLE

Author Details: *Asst. Prof. University of Management and Economics (UME, Cambodia*

Corresponding Author:
Vanthoch SOTH

DOI:
https://doi.org/10.70096/tssr.250301018

Abstract

In this paper, correlations between the time trajectories of inflation rate and GDP growth rate in Cambodia are investigated by employing an ordinary least squares (OLS) regression model, which is a simplicity and suitable to estimate linear association between variables. The achieved results show a weak and statistically significant but also statistically null association which has minor impact of the inflation in the GDP growth of the available data set. Practically this means that change in inflation is not an indicator or the reverse of underlying patterns of GDP growth, and may, indeed, be outweighed by the significance of another macroeconomic variable as a measure of interpreting changes in growth. Diagnostic analysis reveals the presence of non-normed residuals, heteroscedasticity, and apparent autocorrelation as well as other violations of OLS assumptions. These limitations might have stability implications of coefficient estimates and the wider validity of the estimated model parameters, and hence, suggestions are made to continue analysis with more predictor variables adopting next generation model methods.

Keywords: *Inflation, GDP Growth, Ordinary Least Squares (OLS), Regression Analysis, Heteroscedasticity*

1. Introduction

Economic growth and inflation are two of the policy concerns most important in economics that contribute to economic stability. Magnitude of association between these two variables is not triviale; a slight inflation can show some kind of stable economic activity, but unrestrained inflation, in general, leads to destabilization of the economy. That type of duality calls for a critical assessment of the role of inflation in GDP growth, particularly from the point of view of developing economies, such as the Cambodian economy. Evidence of impact of inflation on economic growth has been equivocal and has changed depending on context. For instance, In Nigeria, inflation and growth are obviously mutually inversely related, and thus, high inflation has economic consequences [1]. In addition, in Tanzania it has also been presented that in the case of Tanzania a good negative correlation between inflation and economic growth exists, to say, higher inflation rates are associated with lower GDP growth [2]. Additionally, the threshold effect of inflation has also been investigated for ASEAN countries in which inflation rates greater than the threshold could have growth or innocuous consequences (less valuable or favorable) above the threshold of 7.84% [3]. The aim of this paper is to try to obtain an estimate of the contribution of inflation on GDP growth of Cambodia between 2000 and 2023, using Ordinary Least Squares (OLS) regression, in order to support the policy makers to ensure macro stability.

2. Methodology

The approach to be adopted in this study consists of multiple simplified steps with the aim of deriving an approximation of the relationship between the inflation rates and the GDP growth rate between 2000 and 2023 in Cambodia. Time series of inflation and GDP growth rates were mined from the reputable economic databases, and then delivering a complete dataset for analysis. Ordinary Least Squares (OLS) regression was used to predict GDP growth rate using the dependent variable inflation rate, and it included a constant term to calculate potential baseline effects. This approach supports robust dynamics in economic scientific research in the sense that the approach allows tests of linear relationships between measures of economic state.

Diagnostic tests for the OLS residuals were run as a test of OLS stability, to confirm compliance with the OLS assumptions (homoscedasticity, normality, linearity). At this point, model validity verification and false positive prevention play a crucial role. Nevertheless, the methodological goals of this study will provide a truly novel understanding of inflation and GDP growth dynamics in Cambodia.

Formula:

$$Y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} \ldots + \beta_2 x_{ik} + \epsilon_t$$

Where;
Y_i: $Dependent\ variable\ (response\ variable) for\ observation\ i$
x_{ij}: $Independent\ variable\ j\ for\ observation\ i$
β_0: $Intercept\ (Constant\ term)$
β_j: $coefficient\ of\ the\ j^{th}\ independent\ variable, represent\ itself\ on\ y$
ϵ_t: $Error\ term$

3. Results

The thorough analysis provided by the correlation between the inflation rate and the GDP growth in Cambodia through the use of the ordinary least squares (OLS) regression analysis shows some effects even if the explanatory capability of the model is still not very explicit. The R2 value (0.053) indicates that inflation can explain only 5.3% of the variation in the GDP growth. This terrible model fit is, in itself, further sustained by a revised R^2 of 0.010, therefore indicating only a minimal overall improvement in relation to an uninformative mean-based model. Regression coefficient of inflation was calculated as 0.2227, with positive correlation. Practically this means for every 1% increase in inflation the GDP growth is estimated to grow by approximately 0.223% per 1%. However, the p-value of the coefficient of this item was 0.278, which is higher than the conventional significance level (α 0.05). This lack of statistical significance indicates that the appearance of a relationship between inflation and GDP growth is likely to be spurious i.e., due to random chance rather than a bona fide causal relationship.

The intercept value (6.1161) provides an idea of the predicted GDP growth for no inflation. This provides an approximation to GDP growth not inflated. Despite the informative nature, the precision of such estimates is weakened by the OLS assumption violations exposed through diagnostic analysis. Clustering patterns in the residual plots suggested the presence of heteroscedasticity and the Omnibus and Jarque-Bera tests showed the residuals tended to be non-normal. The Durbin-Watson statistic (0.934) suggests the possibility of residual autocorrelations, with potential implications for the robustness of the inferences. The OLS results reveal the poor predictive ability of the inflation as a single predictor of the GDP growth in Cambodia for the data span. These findings underscore the urgency to implement a greater number of variables and implement 'fancy' regression that will improve model accuracy and produce more accurate outputs.

Model Fit: R^2: 0.053; Adjusted R^2: 0.010. Only inflation accounts for 5.3% of the variation of GDP growth, which corresponds to a poor model fit.
Inflation Coefficient: Value: 0.2227. Interpretation: An increase of 1% in the level of inflation is estimated to correspond to an increase of 0.223% in GDP growth. Statistical Significance: p 0.278 (not significant at α 0.05).
Intercept: Value: 6.1161. Interpretation: In the case of no inflation, GDP growth is estimated to be about 6.12%.

Diagnostic Analysis

Residuals: The residual plot showed clustering and suspected heteroscedasticity, therefore departures from MLS assumptions. Omnibus test and Jarque-Bera test (p 0.05) revealed non-normal residuals.
Durbin-Watson Statistic: Value: 0.934. Possible autocorrelation in residuals, warranting further investigation.

4. Discussion

The results indicate that the direct effect of inflation on GDP growth in Cambodia is limited over the observed period. The coefficient for inflation that is not statistically significant weakens its efficacy as an independent predictor of GDP growth. In addition, the low R^2 value emphasizes the importance of a more versatile model accounting for other macroeconomic variables such as government spending, foreign direct investment, or openness to trade.

5. Limitations

Dataset Size: An analysis was restricted to the use of 24-year time series observations, which may not be sufficient to fully characterize complex economic dynamics.Outliers: Extreme observations in the data (e.g., years of negative inflation rate or unusual GDP growth rate) may be biased in the estimates.Model Assumptions: If OLS assumptions are violated (e.g., the residuals of the time series of the estimated value are non-normal or there is a potential autocorrelation in the residuals), this validation of the model will be compromised.

6. Conclusion

The present paper examined the relationship between inflation and GDP growth in Cambodia by using Ordinary Least Squares (OLS) regression from 2000 to 2023. Results provided a weak yet statistically insignificant association, suggesting that inflation per se is not a good predictor of GDP growth. The explanatory power of the model in terms of GDP growth variability is a poor (R2 0.053) fit. This highlights the need for an advanced model of economic modelling. Diagnostic analyses showed violation of OLS (i.e., nonnormality of residuals, heteroscedasticity, and perhaps serial autocorrelation), which may compromise the stability of estimates, i.e., the estimated structural coefficients could fluctuate with new data (as new data points always introduce additional disturbances into the system). These restrictions lead to the need of to taking into account a greater number of macroeconomic variables i.e., government expenses, foreign direct investment and trade policy, in a later study. Policy makers should entertain these findings as a foundation and the development of more sophisticated approaches using powerful methods is required in order to provide even greater insight into the complex way in which inflation is related to economic growth.

It presents some initial evidence of how the former can be linked to the latter (i.e., to Cambodian GDP growth) as well as that there is more indirect, but however strong, evidence of a bearing from the former on the latter. It is through analysis that future research is indicated to apply increasingly sophisticated methods to increasing data sizes to produce more nuanced macroeconomic insights.

Acknowledgment: No
Author's Contribution: *Vanthoch SOTH:* Data Collection, Methodology, Analysis, Referencing
Funding: No
Declaration/Consent for Publication: Not Applicable
Competing Interest: No

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Appendix

Result

OLS Regression Results

Dep. Variable:	GDP Growth (%)	R-squared:	0.053
Model:	OLS	Adj. R-squared:	0.010
Method:	Least Squares	F-statistic:	1.236
Date:	Mon, 20 Jan 2025	Prob (F-statistic):	0.278
Time:	10:22:56	Log-Likelihood:	-61.990
No. Observations:	24	AIC:	128.0
Df Residuals:	22	BIC:	130.3
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	6.1161	0.976	6.264	0.000	4.091	8.141
Inflation (%)	0.2227	0.200	1.112	0.278	-0.193	0.638

Omnibus:	10.448	Durbin-Watson:	0.934
Prob(Omnibus):	0.005	Jarque-Bera (JB):	8.820
Skew:	-1.125	Prob(JB):	0.0122
Kurtosis:	4.939	Cond. No.	7.12