



Analysis of Inflation and Fiscal Deficit in India

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Abstract: *The paper empirically investigates the relationship and causality between inflation and fiscal deficit from 2005 to 2020 at monthly data. In this paper, the main objective is to find out the effect of FRBM Act-2003 in deterring the inflation level in India. The government expenditure raised the money supply in the economy as more deficit is financed by borrowing and issuing short-term debt instruments. Therefore, the target of fiscal deficit necessarily deters the level of inflation. The empirical result as analyzed using the standard time series econometric model confirms that there is no causation of fiscal deficit on inflation while there is strong evidence of causation of inflation on fiscal deficit. Hence, the finding appropriately explains the causal relationship between fiscal deficit and inflation as inflation is a monetary phenomenon and is determined by market forces including the external sector of the economy. The result also portrays the long equilibrium between inflation and fiscal deficit.*

Keywords: Fiscal Deficit, Inflation, VAR, Cointegration

1 Introduction

The present paper tries to investigate the relationship between inflation and fiscal deficit in India. The inflation is considered here as wholesale price index (WPI) computed and published by the office of the economic adviser government of India while fiscal deficit is measured as the total expenditure of the government incurred subtracted from the total revenue earned by the government during the financial year. The relationship between these two figures may be seen and proved theoretically as one of the sources of inflation is demand pull and expenditure is governed by total demand effectively realized during a particular financial year which indeed has potential to raise market price of goods and services. Here, it is important to be noted that the inflation figure which is a Wholesale Price Index (WPI) is captured only goods not service components. While government expenditure covers both goods and services, therefore, it is important to note that inflation may be determining a part of fiscal deficit not entirety of it due to the absence of service price inflation index in WPI.

Nevertheless, the movement may be captured and the relationship may be analyzed effectively as the government expenditure primarily covers the goods. It is also fact that the weight of goods is normally higher than the weight of service in the government expenditure of developing economies. Therefore, the analysis of

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relationship between fiscal deficit and inflation as per the data and definition available in the government policy documents and database is workable for an empirical enquiry.

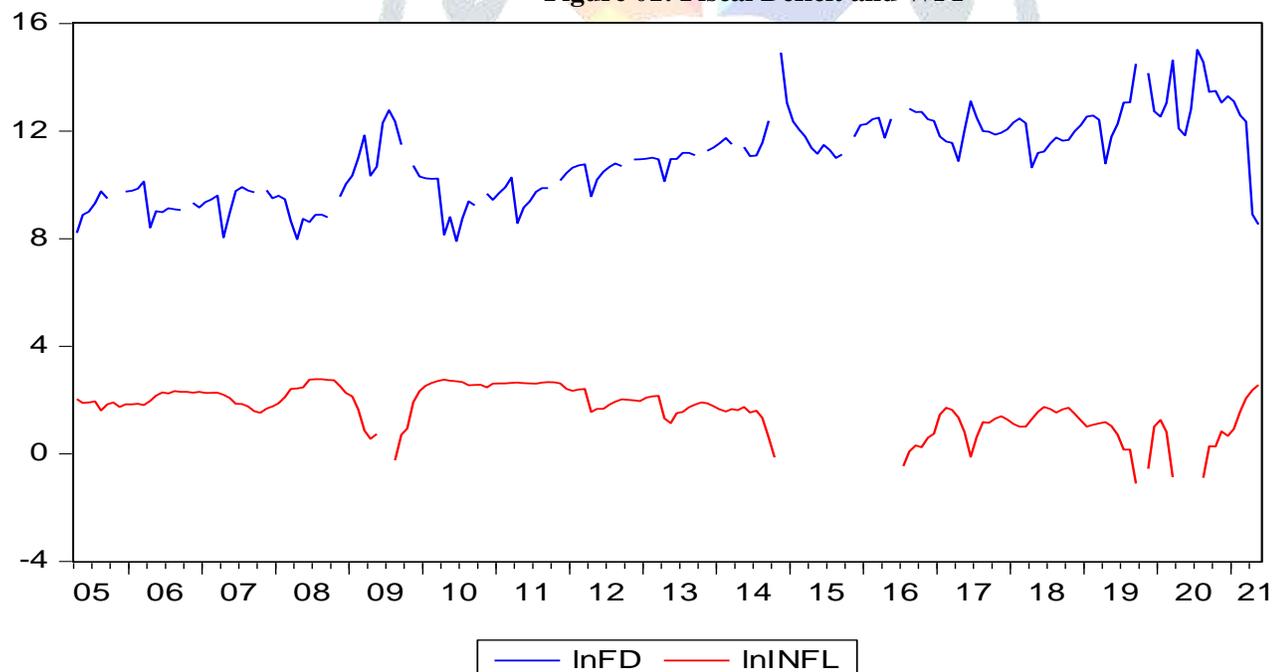
1.1 Fiscal Deficit in India

Historically, the fiscal deficit in India was on rising trend as the target of independent government was to reconstruct the whole economy and mainly focused on the development of the foundation of economy through infrastructure projects and installation of basic industries. It was started in Nehruvian era of economic policy with an objective of self-reliant. The policy of self-reliance remains continued in the philosophy of economic management and the government claimed for even after adopting a significant economic reforms due to severe balance of payment (BOP) crisis erupted in 1990. The government of India approached IMF and the World Bank for the support to rescue economy from the crisis.

The crisis had sought government attention and made public opinion essentially for containing fiscal deficit. Therefore, the government of India since then has been targeting the level of fiscal deficit in every financial year in order to maintain a balance and equilibrium between revenue and expenditure. The more specific policy was institutionalized in this regard was the enactment of fiscal responsibility budget management (FRBM) Act 2003. The visual representation is displayed in figure 1 for a clear view of the movement of fiscal deficit and inflation over time from 2005 to 2021. The justification for this time period may be seen in section-3.

The series appears upward movement with fluctuations in the fiscal deficit during the period. The highest drop in the fiscal deficit occurs in the recent past months. On the other hand, inflation appears stable but in the recent past months there is a big spike in inflation as compared to previous months. The recent past months may be considered as abnormal period as since 2020 there is COVID-19 crisis erupted in the country which disrupted the whole macroeconomic scenario due to nationwide lockdown.

Figure 01: Fiscal Deficit and WPI



Source: Author's compilation

With a closer look into the graph give the idea that the movement of fiscal deficit corresponds inflation or other way around. The financial crisis in 2008 corresponds rise in fiscal deficit and high inflation. The fiscal deficit persists while inflation went down sharply but soon after there is an up in inflation and remain stable till 2014. However, fiscal deficit increased which corresponds the uneven economic situation and up to certain extent political situation too due to general election and the formation of new government the NDA which replaced the INC (Indian National Congress) after completing two consecutive terms. Since then the fiscal

deficit and inflation may be seen as stable with short fluctuation but pandemic recently disturbed the whole path of steady movement of fiscal deficit and inflation. The rest of the paper is organized as follows: the section-2 discusses the literature review, section-3 data and methodology, section-4 result and discussion and section-5 conclusion.

2 Literature Review

The existing literature reveals the influence of fiscal deficit to inflation in India (Khundrakpam and Pattanaik, 2010; Mohanty and John, 2015; Ramu and Gayithri, 2017). These papers have examined linear relationship. Sarma (1982) and Rangarajan and Mohanty (1998) examined the interaction between fiscal deficit and inflation. However, the relevance of their empirical findings is specific to that time prevailing economic condition. Ashra et al. (2004) found the nonexistence of long-run correspondence between reserve bank credit and fiscal deficit and between money and reserve bank credit to the government. Khundrakpam and Goyal (2009) found that fiscal deficit is significantly contributing to inflation via monetary channel i.e incremental reserve money creation and overall money expansion. In the other words the fiscal deficit expands money supply that influences the level of inflation. Khundrakpam and Pattanaik (2010) also found the impact of fiscal imbalance on inflation. RBI (2012), provided evidence about the rise of inflation due to fiscal imbalance in India. Mohanty and John (2015) analyzed and estimated the inflationary determinants by applying the time-varying structural VAR model. They arrived with a result of fiscal deficit impact on inflation. Another study by Ramu and Gayithri (2017) found similar result as reported by Mohanti and John in 2015. There is a study by (Pandey and Shettigar, 2018), who analyzed the impact of fiscal policy on wholesale price index by considering total expenditure of the government using VECM and ARDL bound test. They have found that there is a long run relationship between government total expenditure and general inflation as measured by wholesale price index.

There is recent study by Bhat and Sharma (2019) have examined in detailed the relationship and causality between fiscal deficit and inflation in India motivated from nonlinear model from asymmetric point of view which was propounded by Shin et al. (2014). They found that there is long run direct relationship between fiscal deficit and inflation in an asymmetric paradigm and there is no short-run dynamics observed. The above studies have reported mix of results about the relationship and causality between inflation and fiscal deficit in India. However, most of the studies found that there is relationship between inflation and fiscal deficit but in the long run and have a unidirectional causality between the two. From the above review one can observe that the literature is scant on this topic while the fiscal deficit and inflation have wider implication on macroeconomic dynamics. Therefore, author tries to examine the causal effect of fiscal deficit and inflation in India considering the important policy of the government by enacting FRBM Act 2003.

3 Data and Methodology

In this study a time series fiscal deficit and inflation (WPI) data at monthly frequency is employed for the analysis of their causal relationship. The inflation figure-wholesale price index (WPI) has been accessed from the website of the Office of the Economic Adviser (OEA) and fiscal deficit is accessed from the webpage of controller general of accounts (CAG) ministry of finance government of India. The time period covered from April 2005 to May 2021. The reason behind considering this time period is to look at the relationship between fiscal deficit and inflation in the context of FRBM Act 2003.

The time series analysis primarily and essentially starts with checking the presence of unit root in the data set. The presence of unit root in the series is one of the problems of time series data. The problem is to check the nature of data set i.e whether is stationarity or non-stationary. The time series usually has unit root or non-stationarity. Therefore, we need to address it before going to analyze or estimate the result. The underline test for unit root is Augmented Dickey Fuller (ADF) Test which can be seen as follows.

$$Y_t = \alpha + \alpha Y_{t-1} + \beta X_e + \epsilon_t \dots\dots\dots 1$$

Equation 1 is unit root equation where it is presumed that the series is non-stationary

$$y_t = c + \beta t + \alpha y_{t-1} + \tau \alpha Y_{t-1} + e_t \dots\dots\dots 2$$

Equation 2 is defined as Dickey Fuller or Unit Root test equation

$$y_t = c + \beta t + \alpha y_{t-1} + \tau_1 \alpha Y_{t-1} + \tau_2 \alpha Y_{t-2} + \dots + \tau_p \alpha Y_{t-p} + \dots + e_t \dots\dots\dots 3$$

Equation 3 is as simple as equation 2 but differs in terms of order of autoregressive process which involves higher order as compared to Dickey Fuller test equation. Therefore, it is called an augmented Dickey Fuller test equation. However, the null hypothesis i.e $\alpha = 1$.

3.1.1 VAR Model

$$\log(Y_t) = \beta + \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \dots + \beta_p Y_{t-p} + \epsilon_t \dots\dots\dots 4$$

Equation 4 is general VAR model where, Y_t is the data series and β , is intercept which is constant and β_1 to β_p are the coefficient of lags order p.

$$\log(FD)_t = \beta + \beta_1 FD_{t-1} + \beta_2 WPI_{t-1} + \epsilon_t \dots\dots\dots 5$$

$$\log(WPI)_t = \beta + \beta_1 WPI_{t-1} + \beta_2 FD_{t-1} + \epsilon_t \dots\dots\dots 6$$

The equation 5 and 6 represents the specification of the model considered for the analysis of two-time series data which are inflation and fiscal deficit at monthly frequency. As the model is based on only two-time series so it can be called VAR (1) model. VAR (1) model means each equation is of order 1. In other words, the predictors contain only one lag. Theoretically or based on economic intuitive reasoning both the series are inter-related. Therefore, the variable can be referred as endogenous variables. In the VAR analysis all the variables must be endogenous.

4 Empirical Results

Table 01: Descriptive Statistics

Variable	Observations	Mean	Median	Maximum	Minimum	Std. Dev.
Log(Fiscal Deficit)	178	10.966	10.995	15.016	7.909	1.543
Log(WPI)	167	1.662	1.772	2.776	-1.106	0.831

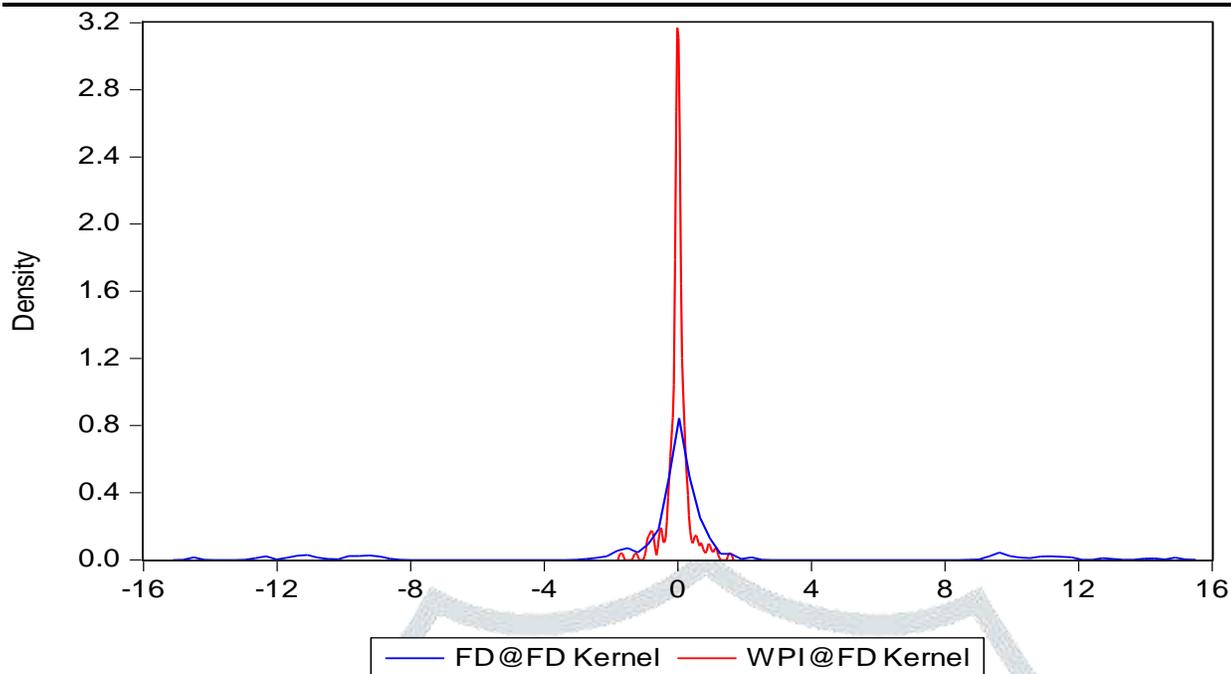
Source: Authors' Computation

4.1.1 Unit Root Test

Table02: Test of Stationarity (Augmented Dicky Fuller Test)

Variable	ADF Test Based on AIC	t-Statistic	Prob.*
Log(FD)	Level	-1.781091	0.3825
	First Difference	-12.93332	0.0000
Log (INFL)	Level	-0.453158	0.8957
	First Difference	-8.624215	0.0000

Source: Author's Estimation, FD: Fiscal Deficit, INFL means WPI (Wholesale Price Index), AIC: Akaike Information Criterion.



The unit root test result clearly shows that all the series are stationary at first difference. The result of unit root is found stationary at 1% level of significance by looking at p-value placed in the last column of the table2. The t-value may also be seen corresponding to p-value which is very high. The same may also be seen from the figure1 which represent zero mean and constant variance and a bell shaped graph appeared showing the normal distribution of time series after first difference. Thus series have been found stationary at first difference which means the order of integration is one. Hence, the conditional criterion for the application of VAR model is achieved. The VAR model can be applied only when the data series follow the first order of integration. Therefore, for further empirical enquiry, VAR analysis has been carried out and the result presented in the following section.

4.1.2 Vector Auto-regression (VAR) Analysis

The basic idea behind the VAR model is the determination of lag value of the dependent variable at different lag length. As the name suggests itself that the model best fits of those parameters whose values impact on itself at certain time interval (time lag). Theoretically, suppose the expenditure pattern of household is determined by the current level of income but also quite possible by its past value as habit of consumption significantly impact on consumption pattern of households. Similarly, several other macroeconomics parameters have causal effect relationship not only with their current value but also with their past values. Such relationship can also be observed in case of government expenditure so fiscal deficit and in the level of inflation.

From the above intuitive and theoretical knowledge, the VAR analysis applied for examining the causal relationship between fiscal deficit and inflation. The result may be seen in the table3. It is found that the fiscal deficit is determined by the lag value of its own and the lag value of inflation. The model is also found representative as the value of R-squared and DW statistics approximate the best of the model. Similarly, the result of joint significant of the variables reported in table 04 can be found. The lag value of fiscal deficit and lag value of inflation determined the fiscal deficit in India. The second model does not show the result as strong as the first appears. Therefore, we can say that the fiscal deficit poorly determined the rate of inflation in India. It means the impact of inflation on fiscal deficit is clearly appeared while the revers is not happening.

Table 03: VAR based Regression Result

Models	Coefficient	Std. Error	t-Statistic	Prob.	R-squared	AR-squared	DW stat
Log_FD-(1)	0.743797	0.069899	10.64095	0.0000*			
Log_WPI-(2)	-0.297501	0.132334	-2.248095	0.0253**	0.791889	0.788873	2.037110
Constant-(3)	3.231583	0.947643	3.410128	0.0007*			
Log_FD-(4)	-0.051154	0.035599	-1.436932	0.1518†			
Log_WPI-(5)	0.821081	0.068278	12.02563	0.0000*	0.794533	0.791737	1.019107
Constant-(6)	0.852907	0.483726	1.763204	0.0789†			

Observations (291), Included Observations (152), *, ** and † represent level of significance @1%, 5% and 10%.

Source: Authors' estimation

Table 04: Joint Significant Test (Wald Test)

Test Statistic	Value	Df	Probability
Chi-square	156.3397	1	0.0000
Null Hypothesis: C(1)=C(2)=0			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(1) - C(2)		1.041297	0.083280
Restrictions are linear in coefficients.			

Source: Authors' estimation

The result appears at 1 percent level of significance. Therefore, we can reject the null hypothesis and can be said that lag of fiscal deficit and lag of inflation have significant impact on fiscal deficit.

4.1.3 VAR-Granger Causality Test

Table 5: Pairwise Granger Causality Tests

Null Hypothesis:	Obs.	F-Statistic	Prob.
LNINFL does not Granger Cause LNFD	124	7.85819	0.0006
LNFD does not Granger Cause LNINFL		.76082	0.1764

Source: Authors' estimation

Table5: VAR Granger Causality/Block Exogeneity Wald Tests

Null Hypothesis:	Chi-sq	Df	Prob.
LNINFL does not Granger Cause LNFD	6.320401	1	0.0119
LNFD does not Granger Cause LNINFL	2.097901	1	0.1475

Source: Authors' estimation

The causality test reveals unidirectional relationship between fiscal deficit and inflation. The pair-wise granger causality as shown in table5 can be found a unidirectional granger causality at 1% level of significance. We can reject the null hypothesis that inflation does not granger cause fiscal deficit. The inflation does granger causes the fiscal deficit while the second hypothesis which states that the fiscal deficit does not granger cause inflation cannot be rejected at even at 5% level of significance. Therefore, it can be stated that even at 5% level of significance there is a unidirectional granger causality that is inflation to fiscal deficit. Similarly, standard VAR granger causality test appeared at 5% level of significance.

4.1.4 Cointegration Test

The long-run relationship between fiscal deficit and inflation is reported by applying two tests as prescribed in text book of econometric by Gjurati and Sangeetha. They have offered a very simple two test for knowing the long run relationship between the two series. The result have been reported below. It shows that there is a long run equilibrium between fiscal deficit and inflation. The first test involves simply by running simple OLS of the given series and obtained error term on which unit root test is to be applied. If the error term appears stationary at first difference it can be said that the series has a long run relationship. The same can be seen from table6 and table7 respectively. The second test is called cointegrating regression Durbin Watson test (CRDW) can also be seen which is quicker and simple. The result can be obtained just by running OLS regression and setting null hypothesis $d=0$ instead standard $d=2$. The supplied critical value of d is 0.511 for checking at 1% level of significance. So if the d value obtained from the OLS is less than the critical value 0.511, we can say no cointegration at 1% level of significance. However, the result so obtained reported in

table6 can be seen that the d is 0.623295 which greater than the critical value. Therefore, it can be stated that there is a long run relationship between fiscal deficit and inflation.

Table06: OLS Result

Model Log(FD)	Coefficient	Std. Error	t-Statistic	Prob.	R-squared	AR-squared	DW stat
Log(WPI)	-1.563224	0.080854	-19.33383	0.0000	0.710915	0.709013	0.623295
Constant	13.36825	0.149839	89.21750	0.0000			

Source: Authors' estimation

Table07: Unit Root test of the error term obtained from the OLS regression given above

Model Log(FD)	Coefficient	Std. Error	t-Statistic	Prob.	R-squared	AR-squared	DW stat
D(RESID01(-1))	-0.652223	0.075627	-8.624215	0.0000	0.324257	0.319897	1.624389
C	-0.071759	0.061359	-1.169494	0.2440			

Source: Authors' estimation

5 Conclusion

The empirical finding suggests that there is a unidirectional causal relationship between fiscal deficit and inflation. Inflation causing fiscal deficit while fiscal deficit doesn't cause inflation. The result seems relevant as the government targets the fiscal deficit since long time. Therefore, the impact of fiscal deficit does not impact the level of inflation. The inflation is a monetary phenomenon and it is largely determined by market forces including external sector due import of fuel oil and other input factors. Therefore, the level of inflation necessarily contributes to fiscal deficit by means of expansion of government expenditure over time. In the long run there is equilibrium relationship between fiscal deficit.

References

- Ashra, S., Chattopadhyay, S., & Chaudhuri, K. (2004). Deficit, money and price: The Indian experience. *Journal of policy Modeling*, 26(3), 289-299.
- Bhat, J. A., & Sharma, N. K. (2020). Identifying fiscal inflation in India—some recent evidence from an asymmetric approach. *Journal of Economics, Finance and Administrative Science*.
- Gujarati, D. N., Porter, D. C., & Gunasekar, S. (2012). *Basic econometrics*. Tata McGraw-Hill Education.
- Khundrakpam, J. K., & Goyal, R. (2009). Is the government deficit in India still relevant for stabilisation? mpra.ub.uni-muenchen.de
- Khundrakpam, J. K., & Pattanaik, S. (2010). Fiscal stimulus and potential inflationary risks: An empirical assessment of fiscal deficit and inflation relationship in India. *Journal of Economic Integration*, 703-721.
- Khundrakpam, J. K., & Pattanaik, S. (2010). Fiscal stimulus and potential inflationary risks: An empirical assessment of fiscal deficit and inflation relationship in India. *Journal of Economic Integration*, 703-721.
- Mohanty, D., & John, J. (2015). Determinants of inflation in India. *Journal of Asian Economics*, 36, 86-96.
- Pandey, A., & Shettigar, J. (2018). Impact of Fiscal Policy Initiatives on Inflation in India. In *Advances in Finance & Applied Economics* (pp. 105-118). Springer, Singapore.
- Ramu, M. A., & Gayithri, K. (2017). Fiscal deficit and inflation linkages in India: tracking the transmission channels. *Journal of Social and Economic Development*, 1(19), 1-24.
- Rangarajan, C. and Mohanty, M.S. (1998), "Fiscal deficit, external balance and monetary growth", Reserve Bank of India Occasional Papers, 18, p. 6.
- Sarma, Y. S. R. (1982). Government deficit, money supply and inflation in India. *Reserve Bank of India Occasional Papers*, 3(1), 56-67.
- Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2014). Modelling asymmetric cointegration and dynamic multipliers in a nonlinear ARDL framework. In *Festschrift in honor of Peter Schmidt* (pp. 281-314). Springer, New York, NY.

Data SourcesMonthly WPI Index: OEA, https://eaindustry.nic.in/download_data_1112.aspMonthly Report:CGA, <https://cga.nic.in/MonthlyReport/Published/3/2019-2020.aspx>**Appendix-A****Test of Cointegration as prescribed in the econometric text book by Gujarati and Sangeetha**

Dependent Variable: LNFD

Method: Least Squares

Date: 08/21/21 Time: 21:24

Sample: 2005M04 2021M05

Included observations: 154

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNINFL	-1.563224	0.080854	-19.33383	0.0000
C	13.36825	0.149839	89.21750	0.0000
R-squared	0.710915	Mean dependent var		10.76755
Adjusted R-squared	0.709013	S.D. dependent var		1.518539
S.E. of regression	0.819148	Akaike info criterion		2.451799
Sum squared resid	101.9926	Schwarz criterion		2.491240
Log likelihood	-186.7885	Hannan-Quinn criter.		2.467820
F-statistic	373.7969	Durbin-Watson stat		0.623295
Prob(F-statistic)	0.000000			

Null Hypothesis: D(RESID01) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-8.624215	0.0000
Test critical values:		
1% level	-3.472259	
5% level	-2.879846	
10% level	-2.576610	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RESID01,2)

Method: Least Squares

Date: 08/21/21 Time: 21:27

Sample (adjusted): 2005M06 2021M05

Included observations: 157 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(RESID01(-1))	-0.652223	0.075627	-8.624215	0.0000
C	-0.071759	0.061359	-1.169494	0.2440
R-squared	0.324257	Mean dependent var		-0.120941
Adjusted R-squared	0.319897	S.D. dependent var		0.928238
S.E. of regression	0.765503	Akaike info criterion		2.316089
Sum squared resid	90.82913	Schwarz criterion		2.355022
Log likelihood	-179.8130	Hannan-Quinn criter.		2.331901
F-statistic	74.37708	Durbin-Watson stat		1.624389
Prob(F-statistic)	0.000000			