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Dynamic Analysis of the Effect of Fiscal Deficit on Inflation in Nigeria

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Abstract

The study is aimed at investigating the short-run and long-run dynamic effects of fiscal deficit on inflation in Nigeria. Autoregressive Distributed Lag Model (ARDL) was applied to time series data from 1970–2016 (of Nigeria). The result, of the estimation, reveals that fiscal deficit is inflationary during the short-run as well as the long-run of the period of study. Findings of the research are limited to Nigeria whose data were used, based on ARDL as the econometrics techniques applied, for a period 1970–2016. The fiscal spending of Nigerian government is one of the factors contributing to inflationary pressure in the country as seen in the findings of the research. The paper was able to prove empirically, the existence of the positive effect of fiscal deficit on inflation in Nigeria, using Nigerian data and also suggest for decision makers in the country to be cautious in terms of the way, the Nigerian government is financing its expenditure through borrowing and fiscal spending.

Key words

ARDL, Commonwealth, Fiscal Deficit, Inflation, Nigeria

JEL Codes: E30, E31, E50

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1. Introduction

Basically, a high rate of inflation is one of the major issues bothering developing economies. It has been maintained that for a country, that is struggling to develop, to make reasonable improvements to its economy, having a reasonable rate of inflation is mandatory. Prices in such country should be relatively stable, with single-digit inflation rate (Anwar and Islam, 2011; Babalola *et al*., 2015; Phiri, 2012; Risso and Sanchez-Carrera, 2009, Danlami *et al*., 2018). Nigeria is one of the West African Commonwealth Countries (WACC) having a population above 180 million, with enriched several endowed resources, including petroleum. The country has been experiencing a problem of a high rate of inflation, mostly above the recommended single-digit. The inflation rates of the country for the period 1970 – 2016 are presented in Figure 1.

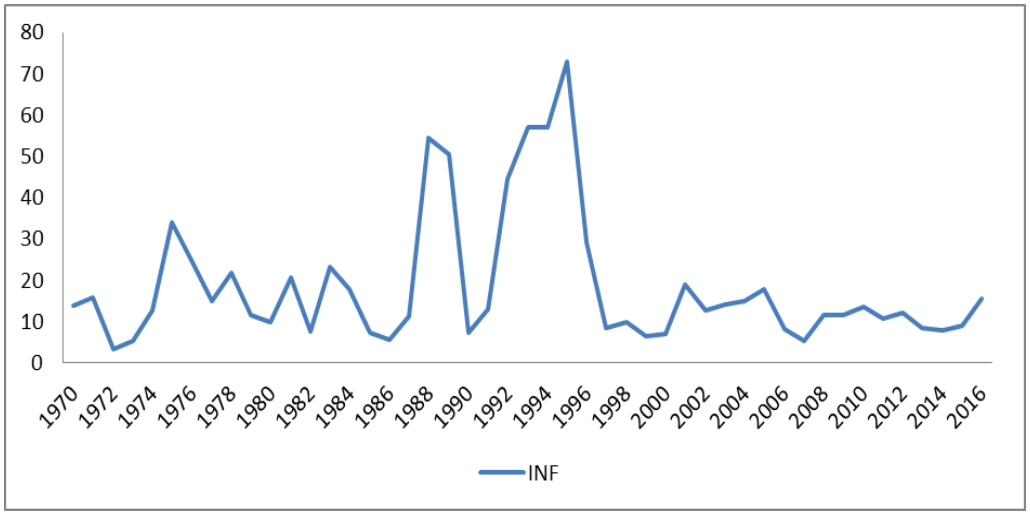

Figure 1. Nigerian Inflation Rate 1970 – 2016

Deficit financing in Nigeria has become the order of the day; it perpetually in the government budget. The period 1970 – 2016 is considered to be that of perpetual deficit financing in the country, given that it features annually with the exception of 1995 and 1996 having a budget surplus of one billion and 32.0494 billion respectively. The rest of the 45 years are of a

budget deficit, could this be one of the sources of inflation in the country? Table one presents the fiscal deficit values of the country.

Table 1. Nigerian Fiscal Deficit 1970 - 2016

YEARS	DEF	YEARS	DEF	YEARS	DEF
1970	455.1	1986	8254.3	2002	301401.6
1971	171.6	1987	5889.7	2003	202724.7
1972	58.8	1988	12160.9	2004	172601.3
1973	166.1	1989	15134.7	2005	161406.3
1974	1796.4	1990	22116.1	2006	101397.5
1975	427.9	1991	35755.2	2007	117237.1
1976	1090.8	1992	39532.5	2008	47379.6
1977	781.4	1993	65157.7	2009	810008.4569
1978	2821.9	1994	70270.6	2010	1105401.408
1979	1461.7	1995	0	2011	1158518.5
1980	1975.2	1996	0	2012	975683.1365
1981	3902.1	1997	5000	2013	1153490.219
1982	6104.1	1998	133389.3	2014	835678
1983	3364.5	1999	285104.7	2015	1557793.319
1984	2660.4	2000	103777.3	2016	2208222.445
1985	3039.7	2001	221048.9		

Source: Statistical Bulletin of Central Bank of Nigeria (2016)

Inflation prevails to be among the most prime economic and other pecuniary factors that can deform commercial activities not only in developing economies but also in developed nations. Even though it has been argued that a moderate increase in price level initiate and energizes economic activities, its persistence is malicious to every economy. At a micro-proportion, it subjectively redistributes income, erases savings, destroys real income, causes price fluctuations and distortions and it ushers improper allocation of productive and other resources at the macro level, thus grasping the understanding of inflation dynamics and its determinants is very essential in the process of constructing or even formulating and undertaking as well as implementing macroeconomic policies for the betterment of the societal welfare (Adenuga *et al.,* 2012).

This study is aimed at exploring the effect of Nigerian fiscal deficit on its inflation rate, during the short-run as well as the long-run periods. The rest and last parts of the research are designed as follows: the summary of a literature review is in the second section of the study, while section three explains the methodological process used in conducting the research and theoretical framework. Section four presents the results of the paper, while the conclusion of the study is highlighted in section five.

2. Literature review

A number of studies were conducted empirically, to specify and indicate the nature of the direction of the impacts of fiscal deficit on inflation rates dynamics are inconclusive; a unanimous direction of relationship or effect, being it positive, negative or insignificant is yet to be established. Among the empirical studies that identified positive or direct influence of fiscal deficit on inflation rate dynamics include Aliyu and Englama (2009), Bayo (2011), Adu and Marbuah (2011), Jalil *et al.* (2014), Nguyen (2014), Ishaq and Mohsin (2015), Anayochukwu (2012), Aurangzeb and Anwar-Ul-Haq (2012), and Kumapayi *et al.* (2012), while few empirical studies that identified negative or inverse influence of fiscal deficit on inflation rate dynamics include Nguyen (2014), Hossain and Islam (2013) as well as Maku and Adelowokan (2013). Lastly, empirical studies that identified the insignificant influence of fiscal deficit on inflation rate dynamics include Odusanya and Atanda (2010), Hossain and Islam (2013), Adu and Marbuah (2011), Olubusoye and Oyaromade (2008), and Aliyu and Englama (2009).

Mweni *et al*. (2016) asserted that high inflation rates that are being experienced in the third world countries are being influenced by the excessive borrowing by the respective government of such countries. The impact of debt and its servicing as well as fiscal deficit on both inflation and the level of growth of the economy depends on the terminal period of the debt, as short-term debt increases debt-reserve ratio only in a very short period of time, its impact on the level of growth of the economy and inflation is only visible in the short-run while that of the long-term debt is visible during the short-run as well as the long-run period of the developing economies (Chudik *et al.*, 2013).

Based on Bayesian Vector Autoregression-VAR, Granger Causality-GC, and Impulse Response Function-IRF) on Nigerian data, Aliyu and Englama (2009) maintained that the (VAR) result indicated a positive influence of fiscal spending on inflation rates. Bayo (2011) (applied Ordinary Least Squares-OLS) on log-linear model stressed that fiscal deficit influences inflation positively in Nigeria. Nguyen (2014) maintained that fiscal deficit is positively influencing inflation rates of the Asian countries (based on the Generalized Method of Moment-GMM method of analysis) and the long-run (of Pool Mean Group-PMG). Ishaq and Mohsin (2015) in their studies of Asian countries (using GMM) asserted that deficits are positively influencing inflation rates. Adu and Marbuah (2011) (using Autoregressive Distributed Lag Model-ARDL, Dynamic OLS-DOLS, and Fully Modified OLS-FMOLS) on data from Ghana confirmed that in the short-run, fiscal deficit influences the rates of inflation positively. Jalil, Tariq and Bibi (2014) confirmed that (using ARDL) fiscal deficit influences the rates of inflation positively during the short-run as well as the long-run periods of their study in Pakistan.

Anayochukwu (2012) (using ARDL) stated that in Nigeria, increases in fiscal deficit are inflationary in the short run. Mweni, Njuguna and Oketch (2016) (applied OLS) to a macroeconomic debt growth model and the result justified that there exist positive effects of debt and fiscal deficits on inflation rate in Kenya. Kumapayi *et al.* (2012) (using OLS estimator) affirmed that fiscal spending influences inflation rate positively in Nigeria. Also, Aurangzeb and Anwar-Ul-Haq (2012) (using OLS) confirmed that fiscal deficit is positively influencing inflation rate in Pakistan. The empirical studies that identified inverse relationship or influence of debt or fiscal deficit on inflation rates dynamics are Nguyen (2014) (using GMM and PMG) maintained that the short run result (of the PMG) indicated an inverse influence of fiscal deficit on inflation rates dynamics of the Asian countries. Also, based on the OLS estimations, Hossain and Islam (2013), reported the lagged value of fiscal deficit inversely affects inflation rates dynamics in Bangladesh. Mweni *et al.*, (2016) (applied OLS) to a macroeconomic debt growth model and a Spearman's correlation coefficient, the result of the Spearman's correlation coefficient revealed the existence of an inverse relationship between debt, fiscal deficit and the inflation rate in Kenya. Finally, Maku and Adelowokan (2013) (using OLS) on Nigerian data stated that fiscal deficit influenced inflation rates dynamics inversely.

In their various findings, Odusanya and Atanda (2010) (using Vector Error Correction Model-VECM) stated that fiscal deficit, in their findings, does not have a significant impact on inflation in the short-run which is also confirming the long-run findings, in Nigeria. On the basis of their Impulse Response Function-IRF results on Nigerian data; Aliyu and Englama (2009) indicated that the retort and response of inflation rate to fiscal spending changes are weak. Meanwhile, based on their ARDL result in Ghana, Adu and Marbuah (2011) stated that the long-run (ARDL) result indicated that there is no evidence of the significant impact of fiscal deficit in accounting the dynamics of the inflation rates in the country. Similar results were reported by Olubusoye and Oyaromade (2008) using VECM and in Nigeria and Hossain and Islam (2013) using OLS in Bangladesh based on the current year value of the fiscal deficit.

3. Methodology of research

Sources of Data: The study utilized time series data from 1970–2016. Meanwhile, the data are sourced from the famous data bank, which is a world development indicator (WDI) of World Bank and Central Bank of Nigeria statistical bulleting of 2016. Consumer Price Index (CPI) is used to stand-in for inflation. Gross Domestic Product (GDP) is used as a measure of economic growth and also official exchange rates, as well as fiscal deficit values, are incorporated and used in the study. All the variables are in logarithm form. It is only the fiscal deficit that is sourced from CBN bulleting the rest of the data are sourced from WDI.

Econometric Techniques: The research utilized Autoregressive Distributed Lag Model (ARDL) given the fact that the variables are mixed stationary (stationary at level and difference). Having a mixed series of data necessitated the usage of ARDL in this study. The results of ARDL estimations are consistent even with a small sample and the method withers away (it is robust to) endogeneity problem (Jalil *et al.*, 2014).

Theoretical Framework and the Model: The study can best be comprehended by arguments of the Neo-Keynesian theory of inflation. The argument of the theory is that inflation and its unwanted high rates are majorly caused by an extreme and excess demand over supply. The theory maintained that money supply increments have no effect on inflation, especially in an economy or country that has voluntary unemployment. In such an economy, the in money supply increments will lead to output expansion and open room for more employment but will not affect the price level. It is only when money supply is increased where there is no room for more employment (full employment) and no room for output increments that it will be transmitted into prices of goods and services (Kennedy, 2011). The aggregate demand can be increased by the increase in either civil or public demand, military demand, or government demand through an increase in government expenditure (fiscal deficit). Thus based on Jalil *et al.* (2014) and Aliyu and Englama (2009), the inflation function can be presented as follows:

$$INF = f(GDP, EXC, DEF) \quad (1)$$

Where: INF is inflation, EXC is exchange rate, and DEF is a fiscal deficit.

Equation (*i*) can be presented, in econometric form and subsequently in the form of ARDL, following Pesaran, Shin and Smith (1999), as follows:

$$LINF = \beta_0 + \beta_1 LGDP_t + \beta_2 LDEF_t + \beta_3 LEXC_t + e_t$$

Where: β_i are coefficients, e is a random variable, t is time indicating time series data, the remains items of the equation are as presented and described in the preceding equation, but now they are in logarithm form with prefix "*L*".

$$\Delta LINF_t = \beta_0 + \sum_{k=0}^{n} \beta_1 \Delta LGDP_{t-k} + \sum_{k=0}^{n} \beta_2 \Delta LDEF_{t-k} + \sum_{k=0}^{n} \beta_3 \Delta LEXC_{t-k} + \sum_{k=1}^{n} \beta_4 \Delta LINF_{t-k} + \alpha_1 LGDP_{t-1} + \alpha_2 LDEF_{t-1} + \alpha_3 LEXC_{t-1} + e_t \quad (2)$$

Where: Δ is difference operator, β_i are short-run coefficients, α_i are long run coefficients.

The ARDL Equation, as presented in Equation (*iii*), is divided into short-run and long-run Equations (*iv*) and (*v*), respectively, as follows:

$$\Delta LINF_t = \beta_0 + \sum_{k=0}^{n} \beta_1 \Delta LGDP_{t-k} + \sum_{k=0}^{n} \beta_2 \Delta LDEF_{t-k} + \sum_{k=0}^{n} \beta_3 \Delta LEXC_{t-k} + \sum_{k=1}^{n} \beta_4 \Delta LINF_{t-k} + \vartheta_0 ECT_{t-1} + e_t \quad (3)$$

Where: ECT_{t-1} simply signifies an error correction term, while ϑ_0 is showing the speed of adjustment.

$$LINF_t = \alpha_0 + \sum_{k=0}^{n} \alpha_1 \Delta LGDP_{t-k} + \sum_{k=0}^{n} \alpha_2 \Delta LDEF_{t-k} + \sum_{k=0}^{n} \alpha_3 \Delta LEXC_{t-k} + \sum_{k=1}^{n} \alpha_4 \Delta LINF_{t-k} + e_t \quad (4)$$

4. Results and Findings

Being the fourth portion of the paper, the findings of the analysis are presented. It started with introducing the expressive-descriptive statistics of the study in Table 2. The LGDP has the highest average value of approximately 24.75, while LEXC has the lowest average value of approximately 2.38. The mean values of LINF and LDEF are approximately 2,60 and 10.06, respectively.

Table 2. Descriptive Statistics of the Variables of the Study

	LINF	LDEF	LEXC	LGDP
Mean	2.60	10.06	2.38	24.75
Median	2.54	10.48	2.85	24.32
Maximum	4.05	14.61	5.54	27.07
Minimum	1.24	4.07	-0.60	22.94
Std. Dev.	0.66	2.83	2.38	1.14
Skewness	0.60	-0.19	-0.09	0.73
Kurtosis	3.04	2.02	1.29	2.45
Jarque-Bera	2.70	2.06	5.56	4.58
Probability	0.26	0.36	0.06	0.10
Sum	117.14	452.86	107.32	1113.63
Sum Sq. Dev.	19.24	351.76	250.10	57.13
Observations	45	45	45	45

Source: Authors' 2019

The unit test result is presented in Table 3 based on Phillips Peron (PP) and Augmented Dickey-Fuller (ADF), which show that the series of variables are not integrated in the same order, *LINF* and *LDEF* are stationary at level while LGDP and LEXC are stationary after being first differenced, from the results given by both ADF and PP estimations.

Table 3. Results of Stationary Test

-Test Type: Variables	ADF Level	ADF First Difference	PP Level	PP First Difference
LINF	-3.89*	_	-3.67*	_
	(0.00)		(0.01)	
LGDP	-1.18	-6.09*	-1.25	-6.10*
	(0.90)	(0.00)	(0.89)	(0.00)
LEXC	-1.70	-5.36*	-1.95	-5.36*
	(0.74)	(0.00)	(0.61)	(0.00)
LDEF	-5.313*	_	-5.41*	_
	(0.00)		(0.00)	

Source: Authors' 2019

Notes: * represents statistically significant at 5 percent level. Figures in parenthesis represent probability. ADF is Augmented Dickey-Fuller and PP represents Philips Peron.

The ARDL (2, 0, 1, 0) estimated based on AIC lag selection criterion, is highlighted in table 4, it is subsequently used in conducting Wald test, as well as estimating the short-run and the long-run relationships after the bounds test for co-integration.

Table 4. ARDL (2. 0, 1, 0) Result

Variable	Coefficient	Std. Error	*t*-Statistic	probability
LINF(-1)	0.42*	0.15	2.85	0.01
LINF(-2)	-0.40*	0.14	-2.75	0.01
LGDP	-0.38*	0.14	-2.74	0.01
LDEF	0.26*	0.10	2.58	0.01
LEXC	-0.77	0.39	-1.96	0.06
LEXC(-1)	0.60	0.37	1.64	0.11
C	9.94*	3.24	3.06	0.00

Source: Authors' 2019

Notes: * *represents statistically significant at 5 percent level. Figures in parenthesis represent probability.*

The table reveals the estimated ARDL result which indicates that *LINF*, *LGDP,* and *LDEF* are significant and the rest of the variables are not, based on this, Wald test was conducted which the results are displayed in Table 5.

Table 5 presents the Wald test result, which reveals all coefficients combined together influences inflation rates. Also, the coefficients of the lag inflation rate influence the current rate of inflation. The coefficients GDP and fiscal deficit influence inflation individually. Conversely, the coefficient exchange rates have no significant effects on the inflation rate.

Table 5. Wald Test Results

Null Hypothesis	***F*-statistics**	**Prob**	**Result**
All coefficients are zero	137.81*	0.00	Reject the null
LINF coefficients are zero	6.01*	0.01	Reject the null
LGDPL coefficients are zero	-2.74*	0.01	Reject the null
LDEF coefficients are zero	2.58 *	0.01	Reject the null
LEXC coefficients are zero	2.50	0.10	Do not reject the null
Constant is zero	3.06*	0.00	Reject the null

Source: Authors' 2019

Notes: * represents statistically significant at 5 percent level.

To estimate the long-run relationship, its existence needs to be investigated which is confirmed by bound test; with the value of F-statistic 4.568945 over and above bound test critical values of I(0) 3.23 and I(1) 4.35 at 5 percent significance level.

The ARDL results of the two periods are presented in Table 6. During the short-run, lag-*LINF*, *LDEF,* and *LGDP* coefficients are significant in explaining the dynamics of Nigerian inflation rates during the study periods. The speed of adjustment towards the long-run equilibrium is fast and highly significant at one percent level with approximately 97.58 percent that is being corrected annually. All coefficients are significant in the long run except that of *LEXC*.

Table 6. Short Run and Long Run Results

S.R Regressors	Coefficients	STD Errors	t-Statistics	Prob
ΔINFL(-1)	0.40*	0.14	2.75	0.01
ΔLDEF	0.263*	0.10	2.58	0.01
ΔLEXC	-0.77	0.39	-1.96	0.06
ΔLGDP	-0.38*	0.14	-2.74	0.01
ECT(-1)	-0.98*	0.17	-5.65	0.00
L.R Regressors				
LDEF	0.26*	0.11	2.51	0.02
LEXC	-0.17	0.10	-1.70	0.10
LGDP	-0.39*	0.14	-2.88	0.01
C	10.19*	2.96	3.44	0.00

Source: Authors' 2019

Notes: * represents statistically significant at 5 percent level

Table 7 shows the post-estimation diagnostic checks. The estimated model is being liberated; being free from Heteroskedasticity, and there is no serial correlation, as well as the errors, are normally distributed.

Table 7. Post Estimation Diagnostic Checks

Test Type	F-statistics	Probability	Result
Breusch-Pagan Test.	1.88	0.11	No Heteroskedasticity
Breusch-Godfrey Test	0.31	0.74	No Serial Correlation
Jarque-Bera	1.24	0.54	Normally Distributed

The estimated model is also stable, as indicated in *CUSUM* and *CUSUM* of squares in Figure 2 to Figure 3.

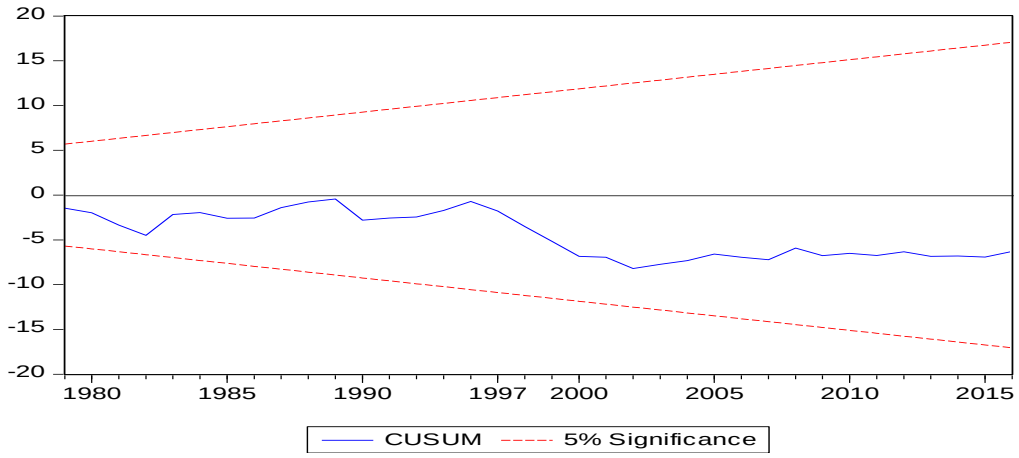

Figure 2. Stability test: CUSUM

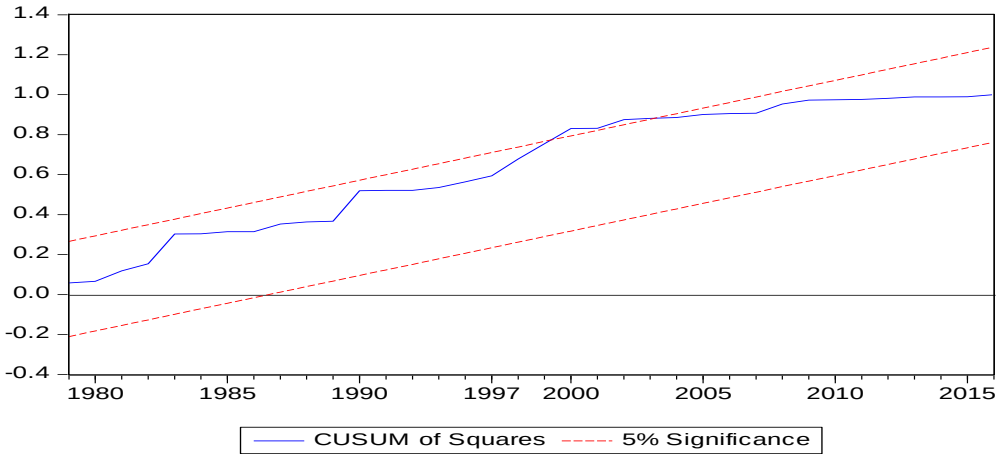

Figure 3. Stability test: CUSUM of squares

5. Conclusions

The results of the post-estimation diagnostic checks reveal that the estimated model does not have serial correlation, while the variance of the error term is constant (no heteroskedasticity), and the errors are normally distributed. The findings of the study indicate that fiscal deficits are inflationary during the short run as well as the long run. The previous year's inflation rate also positively influences inflation during the short run. While economic growth (GDP) inversely influences inflation during the short-run as well as the long-run. On the other hand, the exchange rate is insignificant in explaining inflation rate dynamics during the short-run as well as during the long-run periods. Meanwhile, the value of the speed of adjustment, towards long-run equilibrium, is approximately 97.58 percent. Based on this, the government is advised to exercise caution and to find a way of withering away or reducing the amount of deficit financing in Nigeria given the fact that it is really inflationary not only during the short-run bus also the long-run.

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