In ation and Economic Growth: An analysis of the in ation threshold level of the Nigerian economy

Sadiq Abdulmalik

Cracow University of Economics

February 7, 2023

Conference: ACEFEIB 2023

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Nigerian economy

1. Middle-income, mixed economy and emerging market (Duntoye, 2020).
2. 31st largest economy in nominal GDP & 27th in PPP (World Bank).
3. Largest economy in Africa (World Bank).
4. Strong manufacturing, financial services, communications, technology & entertainment sectors (USaid.gov, 2017).
5. GDP (PPP) increase from $170 billion in 2000 to $451 billion in 2012 (Global tenders, 2022).
6. Population growth from 120 million in 2000 to 160 million in 2010.
7. Oil contributed Two-third of the revenues (Financial times, 2017).

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Research gap

1. Nigerian economy hasn't recorded an inflation of less than 5% for more than 2 decades.
2. No well-defined model of causation. Other studies focus on impact of inflation on other macro-economic factors.
3. Many studies neglected stationarity of data which results to discrepancies, as in the research by Ogwu (2010) and Fatukasi (2012).
4. None of the studies apply extensive set of variables such as; the economic indicators used in this research work.

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Economic growth

Classical Growth Theory

- Economic growth decreases with increase population and limited resources.

Neoclassical Growth Model

- Steady economic growth results with the utilization of Labor, Capital and Technology.

Endogenous Growth Theory

- Economic growth is generated internally.

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Economic theory of Money

Money supply

- Monetary theory stipulates that increase in the money supply will result to rise in economic activities.

Inflation

- Monetary policy is mostly focus on maintaining stable prices (low inflation), promoting full employment and achieving steady growth in GDP.

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The research

Research objectives

1. Presentation of theories on economic growth in relation to monetary and fiscal policies.
2. Identification of research outcomes in the field using different approaches of economic growth and inflation nexus.
3. Selection of economic variables and data analysis using different approaches.
4. Inflation threshold using the economic model by Khan and Senhadji (2001).

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The research

Research hypotheses

1. Economic growth is a determinant/driver of inflation without which Inflation will be in existed.
2. Overall output is the best mechanism that enables economic growth and increase profit on the part of businesses.
3. Low inflation is beneficial to the economy, while hyper-economic growth may be detrimental.
4. The level of inflation needs to be monitored because it could escalate to hyper-inflation.

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The research

Data source and sample

1. The Data for the economic indicator Gross Domestic Product (GDP) and the control variables; Inflation (INFL), Gross capital formation (Gcap), Total trade (TTD), Population (POP), were obtained from the World Bank database for the period of 1960 to 2019.
2. Economic growth rates was determine using the difference of log GDP ($logGDP$) and the inflation rates using the difference of log INFL ($logINFL$).

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Empirical results

Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Max	Min
Growth	59	0.0000	1.2813	3.4361	-3.6411
Inflation	59	0.0125	0.4944	1.8661	-1.2063

- Growth and Inflation seems to share a common trend as shown by the low spread of the mean & standard deviation.

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Empirical results

Stationarity test

ADF and PP unit root test result				
Variable	ADF (Intercept)	ADF (Intercept and trend)	PP (Intercept)	PP (Intercept and trend)
$\log GDP$	-1.099523(0)	-1.602997(0)	-1.119658(3)	-1.823691(3)
$\log INFL$	-4.014721(1)***	-4.473874(1)***	-3.775028(3)***	-4.126876(3)***
$\Delta \log GDP$	-6.357625(0)***	-6.328946(0)***	-6.338376(3)***	-6.307223(3)***
$\Delta \log INFl$	-5.836660(3)***	-5.983537(5)***	-9.745568(3)***	-9.632340(3)***

- The unit root tests in levels ($\log GDP$and $\log INFL$) and first differences ($\log GDP$ and $\log INFL$) for the Economic growth and Inflation.
- The obtained results shows the variables are stationary at difference for both the ADF and PP which requires the con-integration test to determine the relevance of the model.

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Empirical results

Stationarity test summary

Summary ADF and PP unit root tests				
Variable	ADF (Intercept)	ADF (Intercept and trend)	PP (Intercept)	PP (Intercept and trend)
$\log GDP$	I(1)	I(1)	I(1)	I(1)
$\log INFL$	I(0)	I(0)	I(0)	I(0)
$\Delta \log GDP$	I(0)	I(0)	I(0)	I(0)
$\Delta \log INFl$	I(0)	I(0)	I(0)	I(0)

- GDP and INFL are stationary and integrated of order one I(1) as shown in the summary table, because all the tests at first difference rejected the null hypothesis (stationarity) of unit root for the two variables.

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Empirical results

Johansen test

Maximum Eigenvalue Test				
Hypothesized No. of CE(s)	Eigenvalue	Likelihood Ratio	5% Critical Value	Prob.
None**	0.277675	19.96287	15.49471	0.0099
At most 1	0.024637	1.421916	3.841466	0.2331
Trace Test				
Hypothesized No. of CE(s)	Eigenvalue	Likelihood Ratio	5% Critical Value	Prob.
None**	0.277675	18.54096	14.26460	0.0099
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1. The Johansen test reveals the likelihood ratio [LR] statistic indicates a co-integration at 5% significance level. The result of is as follows:
2. The null hypothesis rejected (No co-integration between Economic growth and Inflation).
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Error Correction Model result

Error Correction	$\Delta \log GDP$	$\Delta \log INFL$
Constant	0.016625 (0.06108) [0.27221]	0.026985 (0.01563) [1.72624]
CointEq1	-0.462104 (0.16061) [-2.87711]	0.023287 (0.041111) [0.56648]
$\Delta \log GDP(-1)$	-0.056209 (0.54826) [-0.10252]	0.155355 (0.14033) [1.10710]
$\Delta \log GDP(-2)$	-0.196683 (0.54834) [-0.35869]	0.058081 (0.14035) [0.41384]
$\Delta \log INFL(-1)$	0.100849 (0.14628) [0.68941]	0.000209 (0.03744) [0.00558]
$\Delta \log INFL(-2)$	-0.247779 (0.13778) [-1.79856]	0.038037 (0.03526) [1.07864]
R-squared	0.329577	0.052648
Adj. R-squared	0.262535	-0.042087
Sum sq. resids	8.717131	0.571060
S.E. equation	0.417544	0.106870
F-statistics	4.915966	0.555729
Log likelihood	-27.37884	48.93658
Akaike AIC	1.192101	-1.533449
Schwarz SC	1.409103	-1.316447
Mean dependent	0.006449	0.034073
S.D. dependent	0.486218	0.104690

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Empirical results

Error Correction Model result

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Empirical results

Inflation threshold

k	Variable	Coefficient	Std. Error	t-stat	Prob.	R^2	RSS
1%	C	11.36109	6.023665	1.863561	0.0689	0.926386	1.609788
	$\Delta logINFL$	-0.587259	0.296726	-2.343515	0.0236		
	$D(\Delta logINFL-k)$	-0.103620	0.159461	-0.036212	0.9713		
	$\Delta logGCap$	0.757776	0.435498	-1.674182	0.1010		
	$\Delta logTTD$	0.127089	0.486375	0.061874	0.9551		
	$\Delta logPOP$	-0.112169	0.884698	-0.091977	0.9271		
2%	C	11.22547	5.732682	1.964572	0.0555	0.919620	1.652583
	$\Delta logINFL$	-0.695382	0.352972	-1.663756	0.1030		
	$D(\Delta logINFL-k)$	-0.005774	0.193071	-0.536695	0.5941		
	$\Delta logGCap$	0.729103	0.426042	1.778642	0.0819		
	$\Delta logTTD$	0.039821	0.497976	0.255211	0.7997		
	$\Delta logPOP$	-0.081372	0.840913	-0.133389	0.8945		
3%	C	11.83704	6.065646	1.951488	0.0574	0.914854	1.650805
	$\Delta logINFL$	-0.676436	0.302147	-2.238765	0.0303		
	$D(\Delta logINFL-k)$	0.068872	0.153167	0.449654	0.6552		
	$\Delta logGCap$	0.688418	0.447982	01.536708	0.1315		
	$\Delta logTTD$	-0.008437	0.501216	-0.016834	0.9866		
	$\Delta logPOP$	-0.155753	0.882174	-0.176556	0.8607		
4%	C	11.12185	5.994956	1.855201	0.0704	0.910100	1.638157
	$\Delta logINFL$	-0.678168	0.305203	-2.222027	0.0316		
	$D(\Delta logINFL-k)$	-0.064611	0.175768	-0.367590	0.7150		
	$\Delta logGCap$	0.771012	0.454827	1.695178	0.0973		
	$\Delta logTTD$	0.078570	0.502460	0.156371	0.8765		
	$\Delta logPOP$	-0.078492	0.876664	-0.089535	0.9291		
5%	C	10.00191	0.333686	1.579161	0.1218	0.903074	1.662471
	$\Delta logINFL$	-0.696219	0.307026	-2.267621	0.0286		
	$D(\Delta logINFL-k)$	-0.172820	0.233436	-0.740391	0.4632		
	$\Delta logGCap$	0.724566	0.449984	1.610203	0.1148		
	$\Delta logTTD$	-0.069017	0.523716	-0.131784	0.8958		
	$\Delta logPOP$	0.120335	0.936757	0.128459	0.8984		
6%	C	5.178693	3.622089	1.429752	0.1617	0.942999	0.909239
	$\Delta logINFL$	-0.831925	0.216001	-3.851492	0.0005		
	$D(\Delta logINFL-k)$	-0.026771	0.120520	-0.222130	0.8255		
	$\Delta logGCap$	0.502247	0.318433	1.577245	0.1237		
	$\Delta logTTD$	-0.030303	0.314882	-0.096238	0.9239		
	$\Delta logPOP$	0.767024	0.500751	1.531747	0.1346		
7%	C	15.28778	8.235344	1.856362	0.0708	0.892139	1.600223
	$\Delta logINFL$	-0.565965	0.356892	-1.584973	0.1208		
	$D(\Delta logINFL-k)$	0.119164	0.163208	0.730136	0.4696		
	$\Delta logGCap$	0.789810	0.459753	1.717899	0.0935		
	$\Delta logTTD$	0.158424	0.529530	0.299178	0.7664		
	$\Delta logPOP$	-0.669238	1.199585	-0.557892	0.5800		

Empirical results

Inflation threshold

- Inflation threshold estimation
  - The estimated result for the values of k from 1% to 12%, indicating a significant relationship between the variable of inflation and economic growth. As shown in the table above, when $k = 6$, the value of R-square is (0.942999) which kept increasing to attain a threshold at k=12 for R-square (0.852218), indicating an inverse proportion between R-square and Residual sum of squares (RSS) as seen when R-square was at its peak (0.9429
  - Furthermore, the R^2 is at max when $k = 6\%$, with coefficients of $D(\ \ logINFL\ \ \ k)$ significantly decreasing, when $k\ \ \ 6\%$ which indicates a rate that will inhibit growth negatively. however, it could be seen that when $k \leq 6$, there seems not to be a large difference between the coefficients of $D(\ \ logINFL\ \ \ k)$ which could be an indication of a stable growth.

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Conclusion

Remark

- There is a positive long-run relationship between the two variables.
- Nigerian economy will decline above 6% level of inflation.
- This is in support of the work of (Kremer, Bick & Nautz, 2013) and (Espinonza, Leon & Prasad, 2010) came to the conclusion that inflation between $10 - 17\%$ will not trigger much of instability for developing economies.
- Also, the work of Khan and Senhadji (2001) and Vaona (2012) both supported the notion that 1% and 11% inflation threshold will not undermine both developed and developing economies.

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