

DOES GROWTH CAUSE INFLATION?: GRANGER CAUSALITY TESTS ON 98 COUNTRIES

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Introduction

That at some point higher levels of growth trigger inflation is an unquestioned belief of the financial community. On financial news, shows and broadcasts, in financial papers and in financial magazines, the theme is often echoed and repeated. When growth rates are low, then one hears predictions of the sort that the Federal Reserve is not likely to raise interest rates as present growth rates are considered to be too slow to stimulate inflation and, when growth rates are high, then one often hears prognostications of the kind that the Fed is likely to increase interest rates to slow the growth rate of the economy in order to prevent higher levels of inflation. In 1994, for example, it was widely believed that the Federal Reserve System in the U.S. was aiming to slow the growth rate of the economy. The Wall Street Journal reported that "the current goal of the federal Reserve is to slow the economy to an annual growth rate of about 2.5 percent to avoid a significant acceleration of inflation" (September 28, 1994, P.1). While there has been substantial research looking at the effects of inflation on growth, little actual research has been focused on substantiating whether or not economic growth does indeed cause inflation. The purpose of this paper is to call attention to this unchallenged financial parable, and to take a start at looking at this unquestioned conventional wisdom.

Does economic growth cause inflation? When one starts to think about it, it is not at all clear. A look at the simple equation of exchange, $MV=PY$, given the money supply and velocity are constant, shows a negative, not a positive relationship between real economic growth and inflation. It also suggests that higher rates of economic growth cause lower rates of inflation when the money supply growth and velocity are constant. Given that the equation of exchange is an identity, what type of possible reasoning can one infer is being made to lead the financial community to think that economic growth positively causes inflation? Assuming for simplicity that velocity is constant, higher rates of growth will be associated with higher rates of inflation only when the growth in the money supply exceeds the growth in real economic output. Implicitly, if not consciously, the financial community must be assuming, first, that increases in the money supply are necessary in order to obtain increases in economic growth, and, second, that, at higher levels of economic growth, increases in the money supply must be greater than increases in the growth rate in order to obtain higher rates of economic growth. Perhaps the institutional make-up of modern industrial economies does make these two presuppositions of the financial community true so that real economic growth positively causes inflation.

What is the evidence? Does economic growth cause inflation in modern economies? If such a causal relationship exists, is it more prominent in more developed or in less developed countries?

The purpose of this paper is to try to address some of these questions. Section 2 reviews the recent literature in the area growth inflation. Data and results are presented in Section 3. Finally, the conclusions are presented in Section 4.

Literature Review

Theoretical and empirical literature on inflation focus mainly on wages, unemployment, taxes, interest rates, investments, productivity and other macroeconomic variables. There are no empirical studies that examine the impact of growth on inflation. The standard Phillips curve analysis based on the Keynesian view suggests that higher inflation is positively correlated with lower levels of unemployment. If so, higher inflation should also be positively related to economic output. Tobin (1965) also hypothesizes that inflation reallocates resources in favor of investment and thus the rising price level has positive impacts on capital formation. Empirical findings on this Keynes-Tobin view, however, are scant and weak. Only Bruno and Sachs (1985) find some support for this view. Studies by Lucas (1973) and Taylor (1980) using cross-country analysis find no significant relationship between inflation rate and either the level or the growth rate of output.

More recent studies by Smyth (1992, 1994); Grimes (1991); Kormendi and Meguire (1985) among others, strongly support the neo-classical view that inflation distorts price signals, causes inefficiencies and leads to misallocation of resources that results in lower productivity and economic growth. Smyth (1994) investigates the relationship between inflation and growth for the United States' private business sector using aggregate production function and finds that both inflation and the rate of change in inflation have significant negative effects on economic growth. In an earlier study (1992), he estimates that, "For each one percentage point increase in inflation the annual growth rate is reduced by 0.223%" (p. 568). Grimes' study (1991) covers twenty-one industrial countries and uses annual data from 1961 to 1987. Like Smyth, he too looks into the effects of both the level as well the changes in inflation on economic output of industrial countries. He finds that the coefficient of inflation is negative in nineteen out of twenty-one countries and significant in twelve of the nineteen cases. His major conclusion is that even a low rate of inflation is injurious to economic growth. He estimates that an annual rate of approximately nine percent inflation decreases the annual growth by about one percent (p. 641).

Kormendi and Meguire (1985) also use a production function framework to examine the relationship between the change in inflation rate and output in a cross-section of forty-seven countries. They find that the change in inflation rate negatively affects growth over the period 1950-77. They do not examine the effect of the level of inflation.

In the case of less developed countries, inflation is seen as concomitant with growth. Almost universal feeling in the developing world is that inflation is an inevitable price that countries must pay in the process of development. Many countries have only resorted to finance their development plans by inflation, disregarding the consequences of inflation. However, it is quite possible that inflation retards growth in LDCs in the same way as it does in the case of industrial countries. Inflation does add to uncertainty in making economic decisions and leads to misallocation of resources. Inflation also reduces incentives for innovation and creates balance of payments problems for the developing countries. Appropriate policies to head off inflation may not warrant tight monetary policy, which involves sacrificing growth to achieve price stability; if in fact we find that growth does not cause inflation. Whether growth causes inflation is an empirical question which the following section attempts to investigate.

Data And The Causality Test Results

Granger causality is one of the most common techniques used in economics in assessing causality between variables. To test the hypothesis that economic growth leads to inflation in modern societies, countries from the STARS data set from the World Bank

containing time series data by country from 1970 to 1993 were selected in order to perform Granger Causality tests on a country by country basis for the period 1970 to 1993. Ninety-eight countries were selected primarily on the basis of data availability. Real yearly growth rates were calculated by deflating nominal GDP by the consumer price index to obtain real GDP and then by taking the yearly percentage change in real GDP. Granger causality tests using three lags was employed on each of the ninety-eight countries to test whether real economic growth granger causes inflation, as measured by the consumer price index.

Overall, the results are not favorable for those who maintain that growth causes inflation. In only seventeen of the ninety-eight countries studied was the null hypothesis of no causation running from growth to inflation rejected at the ten percent level of significance or better. This means that in eighty-three percent of the countries there was no evidence that growth causes inflation. This finding has very serious economic policy implications. For instance, in the US if the Fed lowers the potential growth rate by one percentage point to alleviate inflationary fears, the cost in terms of lost output is seventy billion dollars in current dollars representing one percent of nominal GDP.

It may be questioned that overall finding that growth does not cause inflation will not be relevant in the case of highly industrialized countries where financial markets are highly developed, efficient, and where communication is rapid. To test whether it is only in the high income countries that growth causes inflation, the countries were divided into three categories of low, middle, and high income based on the United Nations classification. Countries are classified as low income when their GNP per capita (in 1993 U.S. dollars) is \$500 and below, middle income when GNP per capita is between \$501 and \$6000, and high-income when GNP per capita is above \$6000. Table 1 shows the results.

	Total	Low Income	Middle Income	High Income
# of Countries	98	25	45	26
# Rejecting Null	17	3	7	7
% Rejecting Null	17%	12%	16%	27%

As revealed in Table 1, only three out of twenty-five low income countries reject the null hypothesis. In the case of middle income countries it is seven out of forty-five and in the high income countries it is seven out of twenty-six. Looking at the percentages, there does appear to be some tendency for growth to become a more important causal factor with regard to inflation as the stage of development is enhanced, although even in the most developed countries the percentage is still relatively small with only twenty-seven percent of the countries rejecting the null hypothesis that growth does not cause inflation. Perhaps, this may be due to the possibility that higher levels of development are associated with the development of institutional conditions that are more conducive to a possible causal relation going from growth to inflation. What these institutional conditions might be are certainly an interesting area for future research.

As we have discussed before, the 'problem' is often raised in growing economies that at some point the economy will overheat and generate inflation. This 'concern' becomes even greater as the growth rate increases. One would expect on the basis of this line of reasoning that countries with higher rates of growth are the countries that are more likely to have causal relation between growth and inflation. To consider this possibility, the ninety-eight countries in our sample were classified into three groups, low growth, medium growth, and high growth based on their growth performance. Countries were sorted in ascending order on the basis of their average yearly real growth rates over the period 1970 to 1993 with the first third classified

as low growth, the second third as medium growth, and the final third as high growth. The low growth countries represent countries with average growth rates of 1.94% or below, the medium growth countries with average growth rates of 1.95% to 3.7%, and finally, the high growth countries with average growth rates greater than or equal to 3.8%. Table 2 contains the results.

	Total	Low Growth	Medium Growth	High Growth
# of Counties	98	32	33	33
# Rejecting Null	17	6	8	3
% Rejecting Null	17%	19%	24%	95%

Twenty-six of the thirty-two low growth countries do not reject the null hypothesis that growth does not cause inflation. Thus only six of these countries representing nineteen percent of the total in this group reject the null. In the case of the medium growth category the numbers are similar, twenty-four out of thirty-three not rejecting, only eight or twenty-four percent rejecting the null. The most surprising finding is in the high growth category. Rather than having the highest, it has lowest, with only nine percent rejecting the null hypothesis. This is contrary to the belief that when an economy is experiencing high growth, higher rates of growth will lead to inflation.

The general conclusion so far reached in this study is that in the overwhelming number of countries for the period 1970-93, there is evidence that growth cause inflation. However, some may be inclined to argue that it is the inflationary expectations that are important and that these are more likely to be influenced by the course of economic performance. As seen by them, the year to year growth rate, if stable, may not have much influence on inflationary expectations, and they advocate looking at changes in growth rates and changes in inflation.

To address this possible concern, Granger tests were rerun on all the countries using the change in the growth rate and the change in the consumer price index to examine the causality going from the change in growth to change in consumer price index. The results are very similar to the findings using the levels of the variables with eleven percent of the countries rejecting the null hypothesis of no causality between the variables. Hence, whether the levels of the variables are used or the first differences of the variables are used, there is little evidence that there is any causal chain in any from leading from growth to inflation.

Conclusion

This study has used data on economic growth and inflation for ninety-eight countries over 1970-93 time period. The literature on inflation has focused almost exclusively on the question of whether inflation impacts growth adversely, but not on the question of whether growth has any effect on inflation. Earlier studies by Lucas (1973), Taylor (1980) and Bruno and Sachs (1985) do not support the proposition inflation has any adverse effect on growth, while more recent studies by Smyth (1992) and Grimes (1991) strongly support the views that inflation results in dissertations and leads to lower growth.

This paper has used Granger causality analysis to examine whether or not growth causes inflation. The major finding is that in eighty three percent of the countries the null hypothesis that growth does not cause inflation is not rejected. If the rate of growth does not causally determine the rate of inflation, and a slowdown in growth is tried by policy makers in an attempt to reduce the rate of inflation, then such a slowdown in growth will result in a tremendous cost to the economy in terms of lost output and higher unemployment without curing inflation. Another important finding of the study is that neither high growth nor the change in the rate of growth necessarily lead to higher inflation implying that policy makers

should look elsewhere than manipulating the growth rate in economy when dealing with the problem of inflation.

Appendix 1		
List of High-Income (GNP per capita above \$6,000) and Their Average Annual Growth Rate: 1970-1993.		
	Countries	Growth rate
1	Australia	0.03
2	Austria	2.95
3	Bahamas	1.82
4	Barbados	0.97
5	Denmark	1.94
6	Finland	2.44
7	France	2.60
8	Germany	2.50
9	Greece	2.32
10	Hong Kong	8.31
11	Iceland	4.26
12	Ireland	3.62
13	Italy	3.35
14	Japan	3.26
15	Kuwait	7.21
16	Malta	6.19
17	Netherlands	2.01
18	New Zealand	1.96
19	Norway	2.07
20	Saudi Arabia	11.77
21	Singapore	7.67
22	Spain	3.00
23	Sweden	1.57
24	Switzerland	1.76
25	United Kingdom	2.10
26	USA	2.30

Appendix 2					
List of Middle-income Countries (GNP per capita \$501-\$6,000) and Their Average Annual Growth Rate: 1970-1993					
Sl. No.	Countries	Growth rate	Sl. No.	Countries	Growth rate
1	Algeria	6.83	23	Malaysia	7.20
2	Argentina	0.64	24	Mauritius	6.94
3	Botswana	10.41	25	Mexico	3.37
4	Cameroon	3.00	26	Morocco	3.83
5	Colombia	4.53	27	Nicaragua	-5.08
6	Congo	4.34	28	Panama	4.37
7	Costa Rica	5.83	29	Papua New Guinea	2.83
8	Cote D'Ivoire	1.11	30	Paraguay	6.13
9	Dominica	4.75	31	Peru	-0.51
10	Dominican Rep.	2.55	32	Philippines	2.77
11	Ecuador	5.45	33	Portugal	3.26
12	Egypt	4.06	34	Saint Vincent	5.96
13	El Salvador	0.62	35	Senegal	1.96
14	Fiji	3.24	36	Seycheiles	5.69

Appendix 2 (Continued)					
List of Middle-income Countries					
(GNP per capita \$501-\$6,000) and Their Average Annual Growth Rate: 1970-1993					
15	Gabon	9.84	37	Solomon Island	6.33
16	Guatemala	3.37	38	South Africa	2.93
17	Honduras	3.23	39	Suiname	-1.26
18	Hungary	0.44	40	Syrian Arab Rep	4.37
19	Indonesia	8.07	41	Thailand	7.12
20	Iran, Islamic Rep. of	2.21	42	Trinidad and Tobago	1.55
21	Jamaica	0.97	43	Turkey	5.19
22	Korea, Rep. of	10.48	44	Uruguay	0.85
			45	Venezuela	3.52

Appendix 3		
List Low-income Countries (GNP per capita \$500 and below) and Their Average Annual Growth Rate: 1970-1993.		
	Countries	Growth rate
1	Bangladesh	3.30
2	Burkina Faso	4.28
3	Burundi	1.81
4	Ethiopia	1.2
5	Gambia	3.14
6	Ghana	0.75
7	Guyana	10.95
8	Haiti	1.65
9	India	4.55
10	Kenya	1.4
11	Liberia	-0.83
12	Nadagascar	1.04
13	Myanmar	3.05
14	Nepal	3.38
15	Niger	0.9
16	Nigeria	1.66
17	Pakistan	5.79
18	Sierra Leone	-2.18
19	Somalia	3.44
20	Sri Lanka	5.88
21	Sudan	0.12
22	Tanzania, U.Rep. of	1.61
23	Togo	1.77
24	Zaire	-1.35
25	Zambia	-1.9

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