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Abstract:

The aim of this paper is to search determinants of economic growth in the USA in the long run and the short run for the period 1970 – 2016. By using co-integration analysis and Vector Error Correction Model, we make the compensation of a lot of variables that they did not include with each other before. Empirical analysis show that in the long run that Final consumption expenditure, population, domestic investment, foreign direct investment inflow, and export are the source of economic growth in the long run, however foreign direct investment outflow, military expenditure, tax revenue, and imports are not seen as a source of economic growth in the long run. In the short run, all of the variables have not any effect on economic growth.

Keywords: Macro Determinants, Economic Growth, Cointegration Analysis, VECM, USA.

1. Introduction

As one of the most controversial theoretical question in the history of research, economic growth still the main goal of any economic policy, and this issue is become more challenging due to the multidisciplinary and multidimensionality of this issue, especially, for the locomotive of the world economy such as the case of the American economy.

According to Maillet (1969), we can distinguish several types of determinants of growth: natural wealth, external environment, population, innovation, investment, knowledge, the coherence of development. Sala-i-Martin (2002) has confirmed that there is no single simple determinant of economic growth. Maddison (2001) has identified three interdependent processes that have allowed the joint increase of population and income: the colonization of fertile spaces, international trade, and capital movements, technological and institutional innovation. Acemoglu (2009) distinguished four fundamental causes of growth: the natural environment, culture, institutions, and luck.

The extensive empirical literature has examined the relationship between economic growth and its determinants for different countries and the results obtained are mixed and inconclusive. The rest of this paper is organized as follows: Section 2 discusses the analytical framework and methodological issues. Section 3 presents empirical analysis and results and Section 4 summarizes the paper's findings.

2. Analytical framework and methodological issues

To search the determinants of economic growth, we use the augmented production function including many variables is expressed as:

$$\mathbf{Y = F\,(FCE, P, DI, FDI\ IN, FDI\ OUT, ME, T, X, M)}.$$

Where Y is GDP per capita growth (annual %); P is Population growth (annual %); FDI IN is Foreign direct investment, net inflows (% of GDP), FDI OUT is Foreign direct investment, net outflows (% of GDP), ME is Military expenditure (% of GDP), T is Tax revenue (% of GDP), M is Imports of goods and services (% of GDP), DI is Gross fixed capital formation (% of GDP), FCE is Final consumption expenditure (% of GDP) and X is Exports of goods and services (% of GDP).

Given the long-run nature and the short run nature of the macroeconomic variables and economic growth relationship, it is necessary to test for cointegration, prior to Granger causality analysis. Since the cointegration methodology is fairly common and well-documented elsewhere {Engle and Granger, (1987); Johansen, (1991); Johansen and Juselius, (1990)}, only a brief overview is provided. Johansen (1991) modeled time series as a reduced rank regression in which they computed the maximum likelihood estimates in the multivariate error correction model (ECM) with Gaussian errors. The model is based on the error correction representation given by:

$$\Delta ¥_t = ¢ + \sum_{K=1}^{n-1} \gamma_i \Delta ¥_{t-1} + \delta_i ¥_{t-1} + \varphi_t$$

where $¥_t$ is a column vector of n variables, $¢$ is a vector of constant terms, γ and δ represent coefficient matrices, Δ is a difference operator, and φ_t~N(0, Σ). The coefficient matrix γ is known as the impact matrix, and it contains information about the long-run relationships. After pre-testing for the order of integration for each variable, Johansen's methodology requires the estimation of Eq. (2) and the residuals are then used to compute the likelihood ratio test statistic (the trace test).

3. Empirical analysis and results

The data set in this study consists of observation for GDP per capita growth (annual %), Population growth (annual %), Foreign direct investment, net inflows (% of GDP), Foreign direct investment, net outflows (% of GDP), Military expenditure (% of GDP), Tax revenue (% of GDP), Imports of goods and services (% of GDP), Gross fixed capital formation (% of GDP), Final consumption expenditure, (% of GDP) and Exports of goods and services (% of GDP). The data set is obtained from the World Bank indicators, is annual and covers the period 1970 – 2016.

First, the order of integration properties of the data is examined using two unit-root tests: the augmented Dickey and Fuller (1979) (ADF) and Phillips and Perron (1988) (PP) for the null hypothesis of non-stationary. The combination of the unit root tests results (see Table 1) suggests that the variables are integrated of order one (i.e., I(1)). This implies the possibility of cointegrating relationships. Table 2 provides the results for the Johansen cointegration tests based on an ECM using an optimal lag length of one. Results from the trace test indicate that

the variables in the system are cointegrated. The existence of cointegrating relationships implies that an ECM specification is appropriate. Furthermore, the residuals from the ECM specification are white noise.

Table 3 reports the results of Granger causality tests based on the ECMs. Each column represents an equation for each of the ten variables in the system. For each variable, at least one channel of causality is active: short-run Granger causality through is P-values of the Granger causality test / Wald test for short-term relationships or long-run causality through a statistically significant lagged error-correction term (t-statistics). A significant lagged ECT coefficient implies that past equilibrium errors affect current outcomes. In the short-run, our results point out the presence of unidirectional causality running from foreign direct investment outflows to economic growth without any feedback. Also, we found unidirectional causality from imports to growth without any feedback. Additionally, we recorded the absence of causality between domestic investments, final consumption, military expenditures, foreign direct investment inflows, and exports and economic growth, respectively. However, in the long-run, our findings reported the presence of causality nexus running from final consumption expenditure and foreign direct investment outflows to economic growth.

Table 1: Tests for unit root

Unit Roots Tests	ADF		PP	
	Constant	***Constant, Linear Trend***	***Constant***	***Constant, Linear Trend***
Y	(4.964599)***	(5.132366)***	(4.730394)***	(5.000687)***
	[8.272655]***	[8.175596]***	[26.49243]***	[26.46498]***
FCE	(0.953333)	(2.877089)	(0.953333)	(3.014213)
	[6.095859]***	[6.031523]***	[6.097333]***	[6.033506]***
P	(2.110642)	(2.237096)	(1.398000)	(1.676272)
	[5.084397]***	[5.015988]***	[5.061957]***	[4.993518]***
DI	(0.0607)**	(3.902868)***	(1.889361)	(2.493486)
	[3.742796]***	[3.746867]**	[3.155833]**	[3.132129]
FDI OUT	(1.181749)	(5.185033)***	(2.479975)	(5.190674)***
	[9.294100]***	[9.190573]***	[25.22500]***	[25.21595]***
FDI IN	(2.005667)	(3.734438)**	(1.633642)	(3.203556)*
	[7.018505]***	[6.942929]***	[11.95043]***	[11.79115]***
ME	(1.553159)	(2.057116)	(2.446866)	(2.628290)
	[5.103624]***	[4.993985]***	[5.089907]***	[4.977338]***
T	(3.756092)***	(4.211644)***	(2.639033)*	(2.779812)
	[5.061238]***	[5.012070]***	[5.043771]**	[4.971313]***
X	(1.663633)	(3.449948)*	(1.725110)	(2.365654)
	[5.017018]***	[5.017275]***	[4.953568]***	[4.958316]***
M	(1.757387)	(3.145328)	(1.831919)	(3.148538)
	[7.822132]***	[7.933967]***	[8.386407]***	[8.537897]***

*** ** ; ** and * denote significances at 1% , 5% and 10% levels respectively**

( ) denotes stationarity in level

[ ] denotes stationarity in first difference

Table 2: Johansen cointegration test results

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	
None *	0.890078	393.9983	239.2354	0.0000
At most 1 *	0.808657	296.8469	197.3709	0.0000
At most 2 *	0.753179	224.0847	159.5297	0.0000
At most 3 *	0.657975	162.5246	125.6154	0.0000
At most 4 *	0.565535	115.3183	95.75366	0.0012
At most 5 *	0.433835	78.63810	69.81889	0.0084
At most 6 *	0.395232	53.60780	47.85613	0.0131
At most 7 *	0.325802	31.47973	29.79707	0.0317
At most 8	0.188283	14.13357	15.49471	0.0793
At most 9 *	0.106504	4.955006	3.841466	0.0260

Trace test indicates 8 cointegrating eqn(s) at the 0.05 level

*** denotes rejection of the hypothesis at the 0.05 level**

****MacKinnon-Haug-Michelis (1999) p-values**

Table 3: Granger causality test results based on Vector Error Correction Models (VECM)

Independent Variables	Y	Dependent Variables								
		FCE	**P**	**DI**	**FDI OUT**	**FDI IN**	**ME**	**T**	**X**	**M**
Y	-	0.012406 (0.6837)	0.020205 (0.5388)	0.013971 (0.1210)	-0.020892 (0.7310)	0.068790 (0.6498)	-0.095069 (0.7685)	-0.663626 (0.7509)	0.014731 (0.5092)	-0.014944 (0.0966)
FCE	80.60769 (0.9922)	-	-1.628648 (0.3590)	-1.126207 (0.8906)	1.684065 (0.0074)	- 5.545026 (0.7063)	7.663287 (0.3257)	53.49340 (0.1113)	-1.187429 (0.9517)	1.204595 (0.8741)
P	49.49364 (0.1108)	- 0.614006 (0.0188)	-	-0.691499 (0.5129)	1.034027 (0.6001)	- 3.404681 (0.9687)	4.705307 (0.7794)	32.84529 (0.8526)	-0.729089 (0.0683)	0.739629 (0.2861)
DI	71.57446 (0.5728)	- 0.887936 (0.1358)	-1.446135 (0.7828)	-	1.495342 (0.8269)	-4.923627 (0.5857)	6.804508 (0.0594)	47.49871 (0.9511)	-1.054361 (0.9488)	1.069603 (0.2738)
FDI OUT	- 47.86495 (0.0070)	0.593801 (0.0256)	0.967093 (0.2205)	0.668743 (0.0630)	-	3.292643 (0.2469)	-4.550470 (0.0428)	-31.76445 (0.3144)	0.705097 (0.2140)	-0.715290 (0.0396)
FDI IN	14.53694 (0.6447)	-0.180342 (0.8776)	-0.293713 (0.8134)	-0.203102 (0.5118)	0.303707 (0.9819)	-	1.382011 (0.4487)	9.647096 (0.5775)	-0.214143 (0.9575)	0.217239 (0.4871)
ME	- 10.51868 (0.1240)	0.130492 (0.0110)	0.212526 (0.4242)	0.146961 (0.2752)	-0.219758 (0.1419)	0.723583 (0.7660)	-	-6.980477 (0.9910)	0.154950 (0.4684)	-0.157190 (0.4926)
T	- 1.506872 (0.6020)	0.018694 (0.4113)	0.030446 (0.8015)	0.021053 (0.4175)	-0.031482 (0.2562)	0.103658 (0.9421)	-0.143257 (0.8920)	-	0.022198 (0.3485)	-0.022519 (0.1693)
X	67.88423 (0.1688)	- 0.842156 (0.9700)	-1.371575 (0.8839)	-0.948442 (0.2544)	1.418245 (0.5710)	- 4.669776 (0.9792)	6.453681 (0.5008)	45.04977 (0.7123)	-	1.014457 (0.9239)
M	- 66.91682 (0.4162)	0.830154 (0.6909)	1.352029 (0.6337)	0.934926 (0.5641)	-1.398034 (0.3721)	4.603227 (0.9272)	-6.361711 (0.3978)	-44.40777 (0.9496)	0.985749 (0.1247)	-
Lagged ECT	[- 0.032624]***	[- 1.350376]***	[- 0.04951]*	[0.405836]	[- 1.091462]***	[0.089066]	[0.032599]	[- 0.008835]	[0.006053]	[- 0.32150]

Values in brackets are estimated t-statistics for each cointegration equation.
Values in parentheses are P-values of the Granger causality test / Wald test for short-term relationships
The other values present the coefficients of the estimated variables included in the long-term relationships.
*** ** ; ** and * denote significances at 1% , 5% and 10% levels respectively**

In the long run, final consumption expenditure, population, domestic investment, foreign direct investment inflow, and exports have a positive effect on economic growth. The positive impact of the consumption on growth explained by the fact that the consumption is the source of job's creation and thus enhances the production. Additionally, the positive effect of population on growth is due to the spillovers effects and the synergy of the panoramic society, this leads to positively enhancing the growth path of the American economy. Furthermore, the positive impact of domestic investment is due to the importance of the local community, the local financial capacities adding to the public efforts to stimulate the economic dynamics of the American economy. Also, the significant positive effect of foreign direct investment inflows is justified though through its positive externalities such as the spillovers, the international capacities, the bias of technological transfer, and the additional financial resources positively affect the economic growth, in accordance with the findings of Tiba et al. (2015). Finally, the significant positive effect of the exports on growth is justified by the high value-added of the American exports also the high diversification of the exports' portfolio. However, foreign direct investment outflow, military expenditure, tax revenue, and imports have a negative effect on economic growth. The negative impact of the foreign direct investment outflow is seen as the shortfall for the US economy. The significant negative impact of military expenditure on growth is explained in the long-run as the American government tends to channelize their financial resources to distort the governmental spending function away from the investment in the productive activities towards non-productive fields which generate high rent-seeking behaviors and corrupted practices. In line with the Tornell and Lane's (1999) "voracity effect" theory, where they argued that the availability of revenues coupled automatically with the existence of oriented-public spending policies toward non-productive activities. Also, the significant negative effect of the taxation on growth is justified through the Laffer curve, where the economic growth is panelized as with the threshold of taxation increases. Finally, the significant negative impact of the imports is due to the comparative advantage in the low-stander of the imported goods which negatively affects growth in the long-run {Tiba and Frikha (2018)}. In the short-run, no significant effect detected. This is justified by the fact that these determinants couldn't exert an immediate impact on growth.

4. Conclusion

Due to the importance of the economic growth as the main issue of every economic policy, we attempt to examine the macroeconomic determinants of growth for the American economy

over the spanning time 1970 – 2016. The causality analysis records, the presence of unidirectional causality running from foreign direct investment outflows to economic growth, and from imports to growth. Also, we recorded the absence of causality between domestic investments, final consumption, military expenditures, foreign direct investment inflows, and exports and economic growth, respectively in the short-run. However, in the long-run, we record a causal relationship from final consumption expenditure and foreign direct investment outflows to economic growth. In the long run, our empirical results pointed out a significant positive effect of final consumption expenditure, population, domestic investment, foreign direct investment inflows, and exports on economic growth. Also, our insights recorded a significant negative impact of foreign direct investment outflow, military expenditure, tax revenue, and imports on growth. In the short-run, our evidence pointed out the absence of any significant impact. From our insights a set of implication could be deduced, first, the American authority should re-oriented their expenditure towards productive activities in order to create new jobs, stimulates consumption, and then improving the growth path. Also, the US authorities should set rigorous imports standards in order to preserve the American environment-economic sphere.

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