



## Are GDP fluctuations transitory or permanent in African countries? Sequential Panel Selection Method

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### ABSTRACT

The purpose of this study is to examine whether GDP shocks are transitory or permanent in African countries. The Sequential Panel Selection Method (SPSM) using Panel KSS test with a Fourier function—which is good enough to control for structural breaks and nonlinearity as well as cross-section dependency and heterogeneity is applied to per capita real GDP data for 52 African countries for the period 1969 to 2011. The SPSM classifies the whole panel into a group of stationary series and a group of non-stationary series that is very suitable to identify how many and which series in the panel are stationary processes. The empirical results from several conventional unit root tests indicate that the per capita real GDP for the countries are non-stationary, however, when the SPSM using the Panel KSS unit root test with a Fourier function is conducted, we find that the per capita real GDP are stationary in 50 out of the 52 African countries. Besides, we indicate that allowing for nonlinearities and structural breaks in the series results in more rejection of the null of unit root hypothesis. Our results thereby point out to the importance of the proper modeling of both structural breaks and nonlinearities in real output levels of developing countries. The findings imply that GDP fluctuations in African countries are overall transitory and they provide important policy implications for African countries.

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### 1. Introduction

Determining whether shocks to output levels are transitory (i.e., trend stationary) or permanent (difference stationary) process has important implications vis-à-vis macroeconomic policy-making, modeling and testing, not to mention forecasting (Nelson & Plosser, 1982). Researchers have therefore been especially interested in the time-series properties of real output levels. Determining time series properties of output shocks has important policy implications for forecasting, modeling and evaluating the role of macroeconomic stabilization programs. As regards macroeconomic theoretical modeling, the point of Keynesian business cycle models, governments should apply macroeconomic policies, particularly fiscal policies, to stabilize income fluctuations. In contrast, from the conventional wisdom of the business cycle. GDP fluctuations are temporary deviations from trend. Therefore, consistent with the Neo-classical macroeconomic view, there is no need implementing monetary and fiscal policies to cope with GDP shock since GDP fluctuations are in nature corrected over the long-run. For instance, transitory macroeconomic fluctuations around a deterministic trend imply that the monetary and fiscal shocks have temporary effects on economy. On the other hand, permanent output shocks indicate that the long-run path of output will be unbounded if the fluctuations in output are due to the disturbances that have permanent effects on output such as technology shocks as well as monetary and fiscal shocks (Guloglu & Ivrendi, 2010).

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In this study, we extend the literature by concentrating on African context which provides room to examine behavior of output level from different perspectives. First, African economies have rebounded from the slump which had been caused by the global recession. In 2010, Africa's average rate of growth amounted to 4.9%, up from 3.1% in 2009 (*African Economic Outlook, 2011*). The political events in North Africa are likely to depress the continent's growth to 3.7% in 2011 (*African Economic Outlook, 2011*). However, this forecast is surrounded by considerable uncertainty. Risks are related to the global economy, notably the impact of the earthquake and nuclear crisis in Japan, and to Africa, in particular the development in Libya and Côte D'Ivoire and how this affects neighboring countries. With the assumption that economic normality returns in these countries, Africa's average growth is expected to accelerate to 5.8% in 2012. The current economic recovery in Africa is likely to reduce the cyclical component of unemployment, but structural unemployment remains high in many countries. Second, the last decade has been one of impressive changes in the volume and composition of financial flows to Africa. Between 2000 and 2010 the sum of foreign direct investment (FDI), portfolio investment and official development assistance (ODA) increased almost fivefold, from USD 27 billion in 2000 to an estimated USD 126 billion in 2010 (*African Economic Outlook, 2011*). It is the changing composition of these flows, however, that best represents Africa's new economic dynamism: since 2005 Africa has attracted more FDI than ODA flows. Moreover, Africa's share of global FDI flows has risen over the last decade, from 0.7% in 2000 to 4.5% in 2010. These figures offer an impressive testimony to Africa's changing role in the world and its increasing ability to harness the opportunities from globalization. Nevertheless, some challenges remain. Third, the wave of regionalism in the 90s has spurred academic and professional interest towards the economic effects of regional integration agreements (RIAs). Since the beginning of the 1990s, a number of African countries have established organized stock exchanges partly to satisfy their quest for new capital and encourage indigenization and partly to incorporate elements of market capitalism into their own economies (see *Kim & Singal, 2000; Singh, 1999*), thus sufficient data are available for researchers to evaluate the effect of economic liberalization on economic phenomena. From the points of these views, investigating time series properties of income in African countries is timely and important to discuss whether there is a need for implementing monetary and/or fiscal policies to stabilize income in the process of economic development and of trade and financial liberalization.

This paper therefore aims at investigating the time-series properties of African countries covering the data on per capita real GDP for 52 African countries during the period 1969 to 2011. The study applies the Sequential Panel Selection Method (SPSM, hereafter) procedure using the Panel KSS (*Kapetanios, Shin, & Snell, 2003*, hereafter KSS) unit root test with a Fourier function.<sup>1</sup> The SPSM accounts for structural breaks, nonlinearity, cross-section dependency and cross-country heterogeneity. Moreover, it classifies the whole panel into a group of stationary series and a group of non-stationary series. In doing so, we can clearly identify how many and which series in the panel are stationary processes. In addition to the SPSM procedure, we also carry out several conventional univariate and panel unit root tests for robustness analysis. The empirical results from several conventional unit root tests indicate that the per capita real GDP for all the countries are non-stationary, however, when the SPSM procedure using the Panel KSS unit root with a Fourier function is conducted, we find that the per capita real GDP are stationary in 50 out of 52 African countries. Our empirical findings further suggest that allowing for nonlinearities and structural breaks results in more rejection of the null of unit root hypothesis. Our results point out the importance of the proper modeling of both structural breaks and nonlinearities in real output levels of developing countries. These results have important policy implications for these 52 African countries under study.

There are several novelties from our study. First, to the best of our knowledge, this study is the first of its kind to utilize the Panel KSS unit root test with a Fourier function through the SPSM procedure to investigate the time-series properties of per capita real GDP for 52 African countries. This empirical study contributes to the field of empirical research by determining whether or not the unit root process is characteristic of the African countries' real output levels. Secondly, it is well-known that independence is not a realistic assumption in that the real GDP of different countries may be contemporaneously correlated. To control for any cross-section dependence found among the data sets, we approximate the bootstrap distribution of the tests and this is not done in the previous study which assumes that the individuals are cross-section independent. *O'Connell (1998)* has in fact shown that the true size of both tests can be far greater than the normal size when the underlying data-generating process (DGP) is characterized by cross-section dependence. With these, the current research hopes to fill the existing gap in the literature.

The plan of this paper is organized as follows. The next section gives a brief survey on the literature review by focusing on methodological concerns, followed by description of the data in *Section 3*. *Section 4* briefly describes the empirical methodology and presents our empirical results. *Section 5* concludes the paper.

## 2. Review of the literature

The seminal work of the *Nelson and Plosser (1982)* has triggered interest in investigating the potential non-stationarity of important macroeconomic variables. Studies on this issue are of considerable concern to researchers conducting empirical studies and policy-makers alike. Granted that numerous studies have found support in a unit root in real output levels, critics have, however, staunchly contended that the drawing of such a conclusion may be attributed to the lower power of the conventional unit root tests employed when compared with near-unit-root but stationary alternatives. More than that, conventional unit root tests have reportedly failed to consider information across regions, thereby yielding less efficient estimations. It should therefore not be unexpected that these shortcomings have seriously called into questions many of the earlier findings which are based on a unit root in real output levels.

<sup>1</sup> Recently, in order to address the problem of variables' selection in the cross-country regression models especially in economic growth model, Vector autoregressive Model (VAR), Bayesian model averaging (BMA) and Bayesian Averaging of Thresholds (BAT) approach is used. For more details on BMA, BAT, and VAR approaches, see *Próchniak and Witkowski (2013)*, *Crespo Cuaresma and Doppelhofer (2007)*, and *Kim and Hammoudeh (2013)*, respectively.

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