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COMPOSITE INDICATOR OF ECONOMIC ACTIVITY (CIEA) FOR DOMINICA

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Abstract

Composite indicators of economic activity provide experts and decision-makers with a valuable tool to monitor the trends and turning points in economic activity

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Composite Indicator of Economic Activity for Dominica

I. Overview

1. What do we mean by composite indicators?

- Indicators are pieces of information that summarize the characteristics of a system or highlight what is happening in a system. They are often a compromise between scientific accuracy and the information that is available or could become available at a reasonable cost.
- A mathematical combination of a set of indicators is most often called an "index" or a "composite indicator". Composite indicators are based on sub-indicators that have no common meaningful unit of measurement and there is no obvious way of weighting these sub-indicators for aggregation.

2. Usefulness of Composite Indicators

(1) Composite indicators can be used to summarize complex or multi-dimensional issues, in view of supporting decision-makers; (2) Composite indicators provide the big picture. They can be easier to interpret than trying to find a trend in many separate indicators; and (3) Composite indicators can help attracting public interest by providing a summary figure with which to compare the performance over time.

Composite indicators of economic activity provide experts and decision-makers with a valuable tool that allows them to: (1) monitor the trends and turning points of economic activity; (2) assess the trends in GDP in relation to goals and targets; (3) timely react to deviations from projections and adjust projections to changes in circumstances; (4) monitor fiscal and monetary policies on a more timely basis compared to quarterly and annual GDP changes and make the necessary adjustments; and (5) timely communicate

the public and decision-makers about the performance of economic activity and changes in conditions and directions.

A Composite indicator of economic activity is not intended to replicate GDP as they are different measures and methodologies it provides a view of how the trend of GDP is performing and provides information about the changes in the direction of economic performance. This information is crucial for macroeconomic management including countercyclical fiscal policies.

3. COMPOSITE INDICATORS ALTERNATIVE METHODOLOGIES

- **Accounting Methodologies** (ex. Chile, Mexico): This type of methodologies tries to replicate the methodology used for the compilation of the quarterly and annual GDP. Sectoral indicators are associated with the sectoral classification of economic activities used to compile the quarterly GDP at constant prices or current prices. The weights are the same as those used for the compilation of the quarterly GDP.

  - This type of methodology is feasible and makes sense in a context of a sufficiently developed statistical system, which provides an ample availability of sectoral sub indicators which can be associated and are closely related to the compilation of quarterly and annual GDP.

- **Statistical Methodologies:** Combine indicators using statistical techniques for selecting and weighting the indicators into an 'aggregate composite index". Techniques differ in the statistical and econometric approach used in the selection and weighting of the sub indicators.

  - This type of methodologies requires using good data on the sub indicators, a sound statistical technique, and a transparent method of for compiling the aggregate Composite Indicator.

The most popular methodology is the **Conference Board (US) methodology** (ex. US, Rwanda, Uganda): (1) month-to-month changes are computed for each component; and (2) the inverse of the volatility of the sub indicators are used for weighting the sub indicators and construct the aggregate composite indicator.

II. CONFERENCE BOARD METHODOLOGY FOR CIEA

In 1995, the Conference Board assumed responsibility for computing composite indexes from the US. The Conference Board now produces business cycles indexes for the US, Australia, France, German, Korea, Japan, Mexico and the UK. This methodology has the great advantage n terms of transparence and simplicity compared to other alternative approaches. The methodology can be replicated by users and the high frequency indicators used are those officially published; they are not exposed to any statistical manipulation. In this sense this approach is superior in terms of building credibility in the CIEA produced and in its used for monetary and fiscal policy, and other analytical purposes. In Africa, this methodology is used in Rwanda and Uganda.

METHODOLOGY:

1. Month-to-month changes are computed for each component. If the component series is in percent change form or an interest rate, simple arithmetic differences are calculated. If the component is not in percent change form, a symmetric alternative to the conventional percent change formula is used.

2. The month-to-month changes are adjusted to equalize the volatility of each component. Standard deviations of the changes in each component are computed. These statistical measures of volatility are inverted, their sum is calculated, and they are restated so the index's component standardization factors sum to one (these are known as the component Factors). The adjusted change in each component is the month-to-month change multiplied by the corresponding component factors.

3. The level of the index is computed using the symmetric percent change formula. The first month's value is based on the symmetric percentage formula while the second month’s value is based on a recursive formula used to compute the index levels for each month that data are available.

4. The index is rebased to average 100 in any choice year. The history of the index is multiplied by 100 and divided by the average for the twelve months of the base year.

Steps:

Step 1: Calculate the symmetric percent change $r_i(t)$

$$r_{i(t)} = \frac{y_{i(t)} - y_{i(t-1)}}{\frac{y_{i(t)} + y_{i(t-1)}}{2}} * 100$$

$$r_i(t) = 200 \frac{y_i(t) - y_i(t-1)}{y_i(t) + y_i(t-1)}$$

where $y_i(t)$ is the observation at time *t* for the indicator *i*.
if the given time series is zero or a negative value, or is already in percentage form, simple arithmetic differences are calculated. $r_i(t) = y_i(t) - y_i(t-1)$.

The reason for calculating the symmetric changes is to allow these to be weighted together (steps 2-3) in such a way that the positive and negative growth are treated equally.
With the symmetric growth rate a rise of 50%, followed by a fall of 50% returns to the initial value.

The symmetric growth is best thought of as using the average of the start and end periods over which the growth is being measured. With the normal growth rate formula, it is just the starting point that is used as the reference period for the calculated growth.

Step 2: Calculate a 'weight' for each indicator based on the inverse of the standard deviation of the symmetric changes of each series, i.e.

$$w_i = \frac{\frac{1}{\sqrt{\frac{\sum_t (r_i(t) - \bar{r}_i(t))^2}{n-1}}}}{\sum_i \frac{1}{\sqrt{\frac{\sum_t (r_i(t) - \bar{r}_i(t))^2}{n-1}}}}$$

This choice of weights gives fewer volatile series greater weight and more volatile series less weight. In this way the contributions from each series to the change in the aggregate index are 'equivalent', in the sense that the weight multiplied by the (symmetric) change from each series are equal on average over the time period for which the CEIA is calculated

Step 3: Weight the symmetric percent changes together:

$$r(t) = \sum_i w_i r_i(t)$$

Step 4: Invert the symmetric percentage change to calculate the CIEA:

i.e. since $r(t) = 200\dfrac{y(t) - y(t-1)}{y(t) + y(t-1)}$, we have

$$r(t)y(t) + r(t)y(t-1) = 200y(t) - 200y(t-1)$$

So that

$$200y(t-1) + r_i(t)y(t-1) = 200y(t) - r(t)y(t)$$

$$y(t) = y(t-1)\frac{200 + r(t)}{200 - r(t)}$$

Note the initial starting point for the series can be set arbitrarily equal to 1, t ensure the index covers the full time period covered by the indicators themselves.

This step is required to move back into 'index level space', rather than (symmetric) parentage change space. Note that once back in index level space it is correct to calculate percentage changes from the index in the usual way (i.e. it is not necessary to calculate percentage changes using the symmetric formula, which was simply a device to all the weighting together of the changes of each indictor into a composite index)

Step 5: Re-reference the index so that the average of the reference period is equal to 100.

III. CIEA DOMINICA

Dominica's economic growth was sharply impacted after Hurricane Maria devastated the country in September 2017. Real GDP fell about 6.6 percent in 2017. Growth recovered to 3.5 percent in 2018 and 7.5 percent in 2019. The Covid pandemic hit hard the economy in the first quarter of 2020; real GDP fell about 11 percent for the whole year. After the new slump real GDO increase by about 3.7 percent in 2021. Additional growth recovery is expected in 2022 but uncertainties concerning the Covid evolution, the hike in

interest rates in the US, uncertainties regarding the CBI prospects, and the deteriorated geopolitical context have also increased uncertainties about the evolution of economic growth.

For macroeconomic management it is crucial to have information about the dynamic of economic activity in the short run. How economic activity has been performing in the last months? What is the trend? It is a sustainable trend? In the absence of higher frequent data on economic activity, the economic authorities and international organizations have struggled to assess the short run evolution of economic performance and its main drivers in the Dominica economy.

The Central Statistics Office (CSO) have faced huge challenges trying to collect data and produce some GDP estimates after 2017. This was aggravated as the CSO working plan, which considered key surveys for improve and rebase the GDP from 2006 to 2019, and start working on a quarterly GDP, was interrupted by the Pandemic in early 2020. The weak quality of the limited available economic and social data and the insufficient amount CSO professional staff have contributed to further deteriorate the quality of the GDP estimates.

The main purpose of the CIEA is to show direction and less so the magnitude of growth and is used in the absence of the quarterly GDP or when quarterly GDP estimates are released with a long lag. The CIEA index should approximate trend cycle estimates of quarterly GDP.

The CIEA compilation follows the US Conference Board methodology, which is widely used and relatively easy to compile. Other methods require the use of more sophisticated statistical techniques and have not proven to be superior to the Conference Board approach. This approach has also been recommended by the IMF in several countries, though its statistics department and regional technical assistance centers.

The CIEA for Dominica considers key variables that relate to economic activity performance and reflects the structure of the Dominica economy. Large government sector, tourism oriented, with a small manufacturing sector and a basic agricultural sector. For rebuilding infrastructure damaged after Maria and a housing development program financed mainly with CBI inflows. Dominica is dependent on imports and its exports earnings are mostly derived from the tourism industry.

The CIEA index needs to contain indicators that are available on a monthly basis and ideally with a delay of no more than one month. The CIEA was developed using the average of the raw index for 2018 as the base. In this context the selected indicators are six monthly indicators:

(1) Imports of goods: directly related to GDP through the imports of consumption, intermediate, and capital goods;

(2) VAT gross revenue: directly related to GDP as it reflects the sales turnover in economic activities; The VAT is also a main generator of government revenue to help finance the provision of government services.

(3) Wages and salaries paid in the Central Government: directly related to GDP -income approach- and it is a main driver of consumption of agriculture and manufactures goods, and personal services agriculture, and other consumption;

(4) Visitors' arrivals: drives GDP through dynamic in the Hotels and Restaurants, and transportation;

(5) Cement sales (bags): directly related to the construction industry and capital formation.

(6) Electricity generation (Kwh): It is an intermediate consumption for most of non-agriculture businesses and production, and it is also a main item in the consumption of goods and services of households in the country.

RESULTS AND IMPLICATIONS:

(1) The CIEA shows well the turning points and changes in trend in economic activity. It shows a gradual recovery of economic activity during 2018 and until around the end of 2019 and a negative trend until April-May 2020 time when the Covid pandemic hit Dominica.

(2) After may 2020 the CIEA shows a gradual economic recovery and after August 2021 a more accelerated recovery that has extended until December 2021 (see CIEA monthly and quarterly charts below)

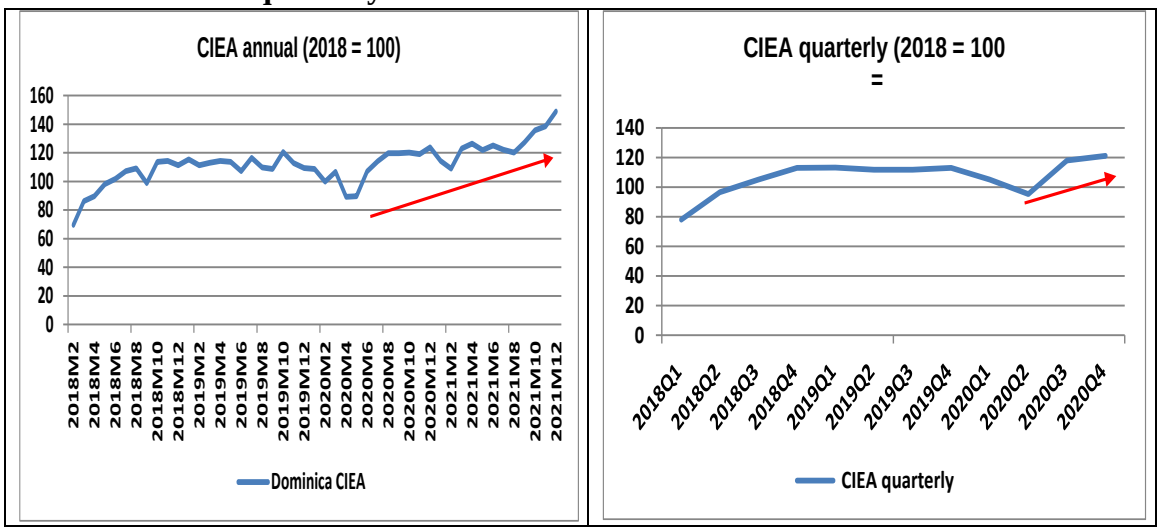
(3) Data of the CIEA component indicators are not yet available for January-February but partial information suggest that growth momentum lost stem since January most likely reflecting the more prolonged pandemic and the increasing financial tightening from lower CBI inflows and higher oil and food prices. Individual CIEA components that fell in January-February compared to previous months are VAT revenue, Wages and salaries, tourist arrivals, cement sales (bags), and electricity generation (Kwh). Wages and salaries fell in January-February from December reflecting annual bonuses.

(4) The CIEA shows a good relation as compared to the GDP nominal and real in terms of trend, which is the main objective of the CIEA monthly indicator (see charts below). The charts below suggest that the economy may has recovered at a faster pace in 2021 than the preliminary 3.7 percent growth.

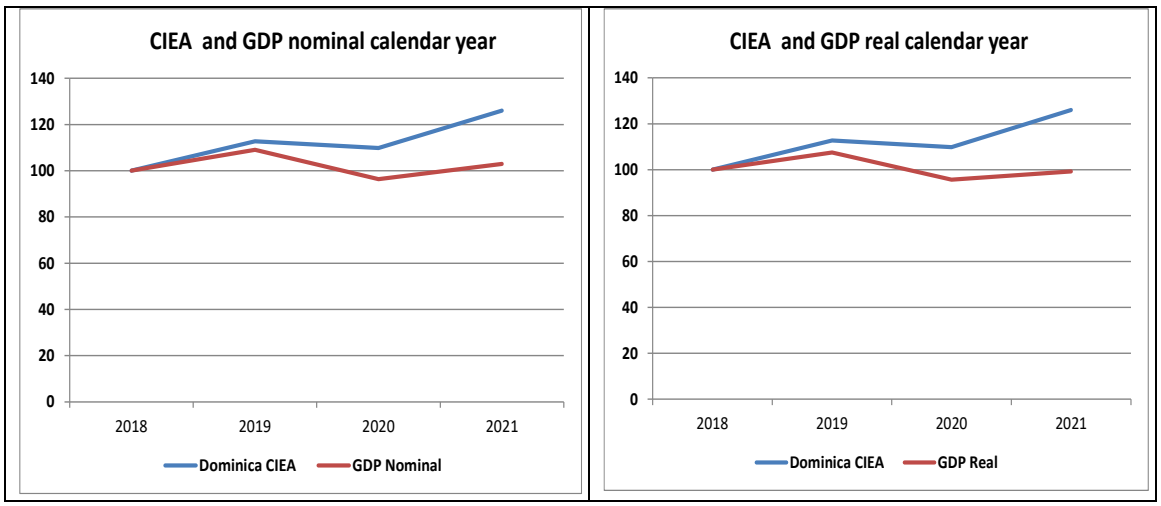
(5) All six components of the CIEA should be normally available with a one-moth lag so the CIEA also should be available with a one-month lag.

CHARTS AND TABLES

CIEA annual and quarterly 2018-2021



CIEA and GDP nominal and real 2018-2021



CIEA and Nominal and real GDP indexes and annual % changes

	CIEA		GDP Real			GDP Nominal		
	Index	% Change	Value	Index	% Change	Value	Index	% Change
2018	100.00		1,108	100.00		1,524	100.00	
2019	112.70	12.7	1,192	107.57	7.6	1,663	109.1	9.1
2020	109.84	- 2.5	1,061	95.75	- 11.0	1,469	96.4	- 11.6
2021	126.06	14.8	1,100	99.29	3.7	1,569	103.0	6.8

ANNEX 1: COMPOSITE INDICATORS OF ECONOMIC ACTIVITY: SELECTED COUNTRIES

ANNEX 1

Composite Indicators of Economc Acivity Selected Countries

Countries	Indicator	Source	Periodicity	Starting period	Type of Methodology	Methodology	Reference for evualating the Composite Indicator	Raw Indicators used
Argentina	Monthly Estimator of Economic Activity (EMAE)	National Statistics Institute and Censuses (INDEC)	Monthly	1993	Accounting Method: Derived from the compilation of the Quarterly national Accounts (Laysperes Index)	Accounting: Follows the sources and methods (and sectorla weights) used for the compilation of the Quarterly National Accounts		
Chile	Monthly Indicator of Economic Activity (IMACEC)	Central Bank of Chile	Monthly	1986	Accounting Method: Derived from the compilation of the Quarterly national Accounts (Laysperes Index)	Accounting: Follows the sources and methods (and sectorla weights) used for the compilation of the Quarterly National Accounts	Quarterly GDP constant prices	Sectoral indicators are associated with the Nationl Accounts sectoral classification of economic activities used to compile the Quarterly GDP at constant prices. The weights are the same as for the Quarterly GDP at constant prices.
Greece	Coincident Indicator of Economic Activity	Center for Planning and Economic Research	Monthly	1970	Statistic/Econometric Method	Nominal variables are deflated and, wherever necessary, series are seasonally adjusted using the US Census Bureau X12 procedure. ADF unit root tests to check for stationarity and cointegration tests to check for cointegration.	Real GDP quarterly data which are converted into monthly data (via a low-to-high frequency conversion procedure applied in EViews)	Industrial production; Retail sales; Imports; Tourims (arrivals of foreigners); and Passenger cars (licenses issued)
Ghana	Composite Indicator of economic Activity (CIEA)	Bank of Ghana	Monthly	2001	Statistic/Econometric Method	Conference Board Methodology 1/	Quarterly GDP constant prices	Electricity consumption, for all kinds of uses in the economy; Commodity Imports; Commodity exports; Sales of selected key companies in Ghana; Employment growth patterns in the economy; Tourist Arrivals in the economy; Port/Harbor operations/activities; Cement sales; Domestic VAT collection; Commercial Banks' Credit to the private sector.
Mexico	Global Indicator of Economic Activity (IGAE)	National Statistics Institute and Geography (INEGI)	Monthly	2003	Accounting Method: Derived from the compilation of the Quarterly national Accounts (Laysperes Index)	Accounting: Follows the sources and methods (and sectorla weights) used for the compilation of the Quarterly National Accounts	Quarterly GDP constant prices	Sectoral indicators are associated with the Nationl Accounts sectoral classification of economic activities used to compile the Quarterly GDP at constant prices. The weights are the same as for the Quarterly GDP at constant prices.
Mozambique	Composite Indicator of Economic Activity (ICAE)	OECD November 2003. Dev/Doc (2003) No. 25	Monthly	1991	Statistic/Econometric Method	*Step 1:* All original data were converted from their original units into index numbers with base on their average level in 1991; *Step 2:* Seasonal adjustment, treatment of outliers, separation of the irregular component from the seasonally adjusted series, and the derivation of the trend-cycle series of each of the individual variable as a Henderson Moving Average; *Step 3:* Aggregation of the individual trend-cycle series into a composite trend-cycle indicator. *Step 4:* Computation of the cyclical Composite Indicator of Economic Activity (the ICAE): first obtain the composite trend (T) component of the composite trend-cycle (TC) series constructed in step 3 above using Hodrick-Prescot filter. Second obtain the aggregate cyclical	The computed ICAE for Mozambique includes variables directly measuring only the activities in the real sector of the economy. It does not include financial or monetary variables.	Index of electricity consumption (originally in Mega-Watts-hour, MWh); Index of commodity exports (originally in $ million, f.o.b.); Index of commodity imports originally in $ million, c.i.f.); Index of port/harbour operations (originally in 1000 Metric Tonnes of total cargo handled, domestic and international, internal destination and transit); Index of volume of cargo ferried by the national rail transport system (originally in million metric tonnes-Km, domestic and international, internal destination and transit); Index of cement production (originally in million metric tonnes).
South Africa	Composite coincident business cycle indicator	South Africa Reserve Bank	Monthly	1980	Statistic/Econometric Method	Conference Board Methodology 1/	Quarterly GDP constatnt prices	The gross value added at constant prices, excluding agriculture, forestry and fishing; the value of wholesale, retail and new vehicle sales at constant prices, weighted according to their respective contributions to gross domestic product; the utilization of production capacity in the manufacturing sector; total formal non-agricultural employment; and industrial production index, comprising the physical volume of manufacturing production, the physical volume of mining production and electricity generated, weighted according to each sector's contribution to gross domestic product.