

Working Document n°2 - November 2013

BCTL Economic Activity Indicators:

“Simple composite indicators for the domestic economic cycle”

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Synopsis:

This document describes the methodology that underpins BCTL’s economic activity indicators, used to monitor Timor Leste’s near term economic developments. It provides a simple and “up-to-date” framework that prioritizes domestic economic data releases according to their economic relevance, so as to offer a more informed view of ongoing economic developments. It might be especially useful for policymakers and general concerned public to monitor ongoing economic trends and better support economic policy decisions.

1. Introduction

This working document is the second of a series of technical documents prepared by the Economics Division that intends to progressively upgrade BCTL's analytical framework to assess economic trends and policy options in Timor Leste. This work explores the specific theme of Timor Leste's economic cycle and proposes 2 simple composite indicators to track the cycle on a more frequent and timely basis.

As is widely known, gross domestic product (GDP) data - whereas in level, nominal or real, or in growth rates - is one of the main economic indicators used to track overall economic developments across economies. In the case of Timor, this indicator is also and naturally very relevant, especially as to what refers to the non-oil GDP importance for assessing the developmental experience of the country. The problem is that GDP data has only been compiled and disclosed by "*Direcção Nacional de Estatística*" (DNE) with a significant lag and only for an annual frequency, despite great recent improvements¹. Note, for example, that in October 2013, we had only available annual GDP data from 2000 until 2011, thus a dataset of 11 annual observations for nominal and real GDP.

This fundamental data restriction causes severe limitations in terms of monitoring and tracking near term domestic economic developments, thus forcing policymakers to "navigate blindly" the current and near term economic trends. In truth, we may be exaggerating, as DNE and other public institutions already compile and disclose information for a significant set of domestic economic statistics. The problem with this dataset is that most of the series refer mostly to aggregate domestic demand and cover a narrow number of economic sectors, being the most important: imports, public expenditure and revenue, banking and vehicle registration and electricity consumption. In addition, despite the existence of sectorial data, there is currently no aggregation of data that might make it useful to monitor ongoing economic developments.

This is the statistical outset that underpins this document and the proposal of a methodology useful to track ongoing economic developments. As such, it intends to build on existing statistics and combine the more relevant economic variables into a single composite indicator, capable to track adequately ongoing economic trends. The main features of our proposal are its simplicity and "up-to-date" nature, which allow us to digest macro-economic data releases in a structured and prioritized manner and on a timely basis.

This proposal aims specifically at reinforcing BCTL's statistical tools and analytical framework put in place to monitor macroeconomic developments and better inform the Bank's views on future near term

¹ Note that DNE has recently published (2013) annual national accounts for 2000-2011, whereas as up to 2012, we had only GDP data from 2004 until 2010. Note also, that the recent efforts in terms of compiling Household Expenditure Surveys (2011) and Business Activity Surveys (2011) have also greatly increased our understanding of domestic economic system.

economic trends. Despite serving BCTL's internal needs, we hope that it may foster active and productive debate with other national institutions and relevant partners, whose views we kindly invite, so as to improve its general usefulness.

In terms of the document's structure, we present first a simple synthesis of common and best practice international approaches in this context and proceed later with some methodological considerations and with a description of the existing economic dataset for Timor. The following sections explain the method used to compile the indicators and the select the relevant series. We then continue with a simple illustration, by analyzing historical and ongoing domestic economic developments, before we finish with some overall conclusions and suggested further steps to improve the new statistical tools.

2. Best practice

The need to have a “real time” indicator of ongoing economic trends is a broadly felt need across the world for economic policymakers and institutions engaged in monitoring macroeconomic trends within a country, region or on a global scale. Such a widely felt concern is particularly relevant for developed economies, where real-time economic updates are fully required by companies and institutions alike and best practice policymaking relies heavily on excellent and filtered economic data. Despite the importance of statistics in modern economies, the abundance of information, data releases and indicators also seems to be more of a hassle than a benefit for nowadays economists, as the data flow can be really overwhelming and, if not structured and prioritized, paradoxically uninformative.

We can safely state that GDP statistics, normally disclosed on a quarterly basis with no more than a 2 months lag beyond the end of the quarter for advanced economies, still deserve great focus for most worldwide policymakers. Although important, national accounts statistics are losing their “informative dominance” as other readily disclosed statistics, such as industrial production, manufacturing and non-manufacturing surveys, business and consumer confidence, sector and company level hard data have displaced their traditional advantages. These new statistics are compiled with greater frequency - some times monthly or an even infra-monthly basis - and provide the active analyst a rich seam of information to dig on. When properly combined or structured, these statistics provide a more informed and sectorial-wide view of economic developments, which greatly surpasses GDP's data informative content. Equally important, the greater frequency and lower lag for these data releases have allowed institutions to compile real time economic cycle indicators and develop “now cast economic models” which depict accurately, with no bigger lag than 1 month, ongoing general economic trends. The data richness of such models and its wide sectorial nature has even fed arguments that traditional national accounts data are bound to lose its relevance for near-term economic cycle analysis.

Our present day context for Timor, in terms of economic data, is certainly different from the above mentioned reality for advanced and largest emerging economies. Although we would be very pleased in having quarterly GDP data for our economy on a timely basis, what we do have now is a diversified but unbalanced set of sectorial statistics - monthly or quarterly - which we could put to work to have a more informed view of economic developments.

In this quest, we borrow from the rich international experience an appropriate method to combine scattered economic data into a relevant and informative composite indicator for the national economy. Our approach is nowhere innovative or revolutionary, but instead results from a pragmatic application of best international practices in this field to the specific context and restrictions of our economy and existing statistical framework. Since we make use of such practices, which might defer in econometric and data complexity, we present below some of the common features of such methods to compile composite economic indicators across most of the world economies:

- select a reference series, which will be used as a proxy of the economic cycle. The variables most commonly used are GDP and industrial production;
- assess the degree of correlation/closeness between the reference series and all other economic series available, compiled on a lower frequency (i.e. monthly). This could be done by employing complex econometrics, economic cycle's turning point analysis (as suggested by US's NBER) or, increasingly, principal component analysis, given the size of present day economic datasets;
- select the series that better correlate to the economic cycle's reference, taking into account also the need to have series from different economic sectors, that is a balanced set of proxy series;
- combine selected series into composite indicators, that can track economic developments on a monthly basis across a multitude of economic sectors. These composite indicators could be built to produce leading, coincident and lagging indicators of the cycle, as OCDE suggests²;
- test the statistical reliability of the composite indicators, analyze economic cycle duration and breadth and cross-check indicators with economic cycle's data.

These elements thus constitute the common elements for most approaches concerned with compiling "real time" economic composite indicators. In what follows we adapt these principles to the economic reality of Timor Leste.

² For an excellent and detailed presentation of the methodologies available to compile economic activity indicators, see "OECD System of Composite Leading Indicators" and "Handbook on Constructing Composite Indicators - Methodology and User Guide", published by OECD in 2012 and 2008, respectively.

3. Economic dataset

This section describes the economic dataset used to compile the composite indicator envisaged as a proxy for the domestic cycle. As already stated, DNE and other public institutions, including BCTL, already compile a vast set of economic data series, for a significant number of economic sectors. This set is unbalanced as great weight is presently given to statistics measuring aggregate demand developments, such as imports and public expenditure, whereas we still lack a sufficient number of statistics available to monitor overall aggregate supply or private sector capacity and production trends. As a good example of supply side statistics, we have already quarterly data regarding electricity consumption and production and vehicle registration series, but still lack other useful statistics common in other countries, such as: aggregate retail and wholesale sales, production levels, investment trends and composition, business confidence indicators and accounting and financial data for companies.

Given this limitation, we might say that our proposed indicator is currently more suited to track developments for aggregate domestic demand, as it contains very little information regarding the supply side. As we further develop the national statistics system, we hope to incorporate, in the future, more supply side information and thus improve the economic breadth of our indicators. The table below presents a synthetic description of the economic time series used during this work, according to their sectorial nature.

Available Statistical Dataset - Sectors Covered and Individual Statistics

Sector	Statistic	Sector	Statistic
1. Imports	Consumer Goods	4. Banking Data	
	Construction Materials	4.1 Deposits	Companies
	Imports Proxy		Households
	Fuels		Total Deposits Private
2. Public Expenditure		4.2 Credit	Companies
	Wages		Individuals and Others
	Transfers		Total Credit
	HH Spending	4.3 Payments Data	Inflows
	Goods & Services		Outflows
	Minor Capital		Net Outflows
	Major Capital	5. Real Activity data	
	All Capital	5.1 Electricity Consumption	Domestic
	Budget Total		Commercial
3. Public Revenues			Total Private
	Taxes	5.2 Vehicle Registration	Nº Motocycles
	Non-Tax		Nº Light Passengers
	Agencies		Nº Light Merchandise
3.1 Tax Revenue	Commodities		Nº Heavy
	Income		Total vehicles
	Service		
3.2 Non-Fiscal Revenue	Fees & Services		
3.3 Agencies Revenue	EDTL		
	Ports		
	Aeroports		

At the end of June of 2013 we already count with 39 time series, with an average of 41 quarterly observations for each series. As noted, the available dataset contains valuable information to assess trends for imports, government expenditure, fiscal and non-fiscal revenue, banking, financial and payments system data as well as casuistic energy consumption and production and vehicle registration. Except for energy and vehicle data, most of our series are measured in nominal values and very little information is provided in terms of quantities. The case for imports is a clear example of this limitation, where we have import values on a monthly basis, but no measure of imported quantities or volumes on a consistent and frequent basis.

As any standard economics textbook would recommend, we should always base our economic analysis in terms of real economic values, instead of nominal values, since the “time value of money” concept does not confer the same “economic” value to the same amount of money at different moments in time. In the case of Timor, this is particularly so, given the recent high inflation rates. As so, we will use throughout the document real values for our dataset, which was computed by deflating nominal reported values with a non-food price index, based on a core non-food inflation index used by BCTL³.

Note that we prefer to use a non-food price index, since almost every series used refers to a non-food related category. The use of this deflator, whose base was set as December 2012, has the advantage to compute real values for the dataset in 2012 end dollar terms. Note, however, that using nominal, instead of real values, would change very little the main conclusions of our approach.

4. Previous considerations

Here we explain, with greater detail, the computational methods used to analyze the informative content of each time series, which is illustrated with the case for total public budget expenditure. Before we proceed with our example, please note that we made use of the following techniques:

- **time series smoothing** - most domestic time series are very unstable on a quarterly basis, which forced us to consider the use of “smoothing” techniques, the most simple and intuitive being the 4 quarter average or a 5 quarter centered moving average. We preferred to use the simple 4 quarters average as it stabilizes most series and does not subtract much needed data for the more recent periods.
- **dynamic analysis focus** - whereas quarterly levels are important, we are more concerned with year on year and quarterly changes of the variables. Given our in-depth analysis of the available

³ Note that using core non-food inflation to deflate nominal values yields practically the same results as using the simpler non-food inflation rate. We preferred to use core non-food inflation because it is less affected by extreme price movements in some CPI non-food items and also because it smoothens the impact arising from the introduction of the new CPI at the end of 2012.

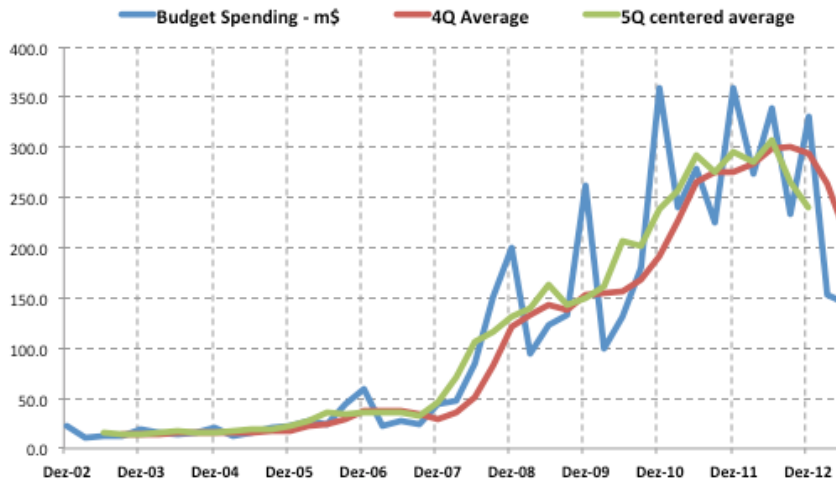
- dataset, we prefer to focus on year-on-year changes of the variables, as they offer a clear dynamical picture of ongoing developments.
- **absolute year-on-year variations** - we prefer to use year-on-year absolute changes instead of yearly percentage changes as they correlate better to domestic inflation dynamics - which we consider a good proxy for the economic cycle - and are more stable, since percentage changes are very unstable, given the volatility of time series and low starting points of most series. Since this represents a significant departure from most approaches in this field, we hope that the illustration that follows, as well as further justification included in this document, does state sufficiently the case for our preference.
 - **data normalization** - since we are keen in compiling a composite indicator for the domestic cycle, which is based in very different series - imports, public expenditure, credit and public revenue - in terms of levels and variability we employ a normalization technique that facilitates comparison across time series. In particular we employ a normalization technique know as “z-score” which consists in “standardizing” time series annual changes, by subtracting their historical averages and division by the historical standard deviation.

Given this succinct theoretical explanation, we proceed with an illustration, hoping to make an intuitive demonstration of the techniques’ usefulness. We use as example the public expenditure time series, as it is one of the fundamental drivers of our domestic economy.

As you can see below, domestic public spending has increased massively throughout the last decade. In fact, nominal public spending has increased almost 21 times, from December 2003 until December 2012, which amounts to an annual growth rate of 232%. In 2003, average quarterly spending amounted to \$13.5 million dollars, while in 2012 it increased to \$294 million, corresponding to an annualized value of \$1176 million dollars. The picture below presents the quarterly spending values, as well as the respective 4 quarters (lagged) and 5 quarters centered averages⁴. It is clear that quarterly actual spending is a very volatile time series, whereas the averages manage to stabilize the series and offer a clearer view of actual spending trends. Another advantage of using average comes from the fact that it neutralizes seasonal effects for the data, avoiding the use of more complex methods to remove “seasonal effects”.

⁴ The 4 quarters lagged average corresponds to the last 4 quarters average value, while the 5 quarters centered average amounts to the average of prior 2 quarters, present quarter and posterior 2 quarters.

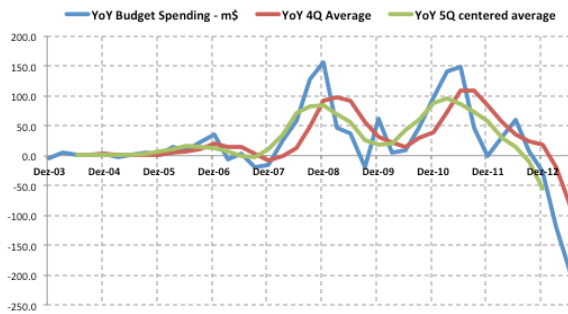
Public Spending trends - quarterly values, 4 quarters and 5 quarters centered averages



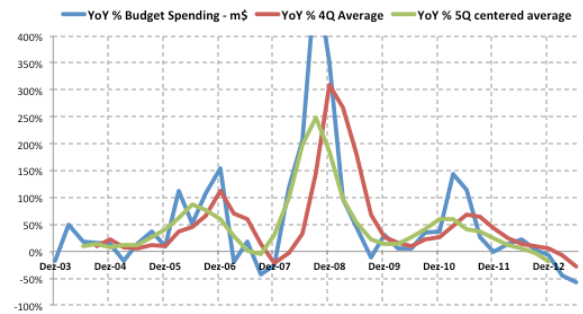
Source: Government Spending Transparency Portal and BCTL estimates

These points are also made visible, if we analyze the series in terms of yearly changes. The picture below depicts developments for yearly changes in public spending, presented as year-on-year absolute (million dollars) and percentage changes. As can be seen, the averages still offer a clearer view of annual developments, as they are more stable and persistent through time. It may also be confirmed that annual absolute changes are more stable, than percentage variations, as initial low starting values “distort” yearly percentage values. A clear example of this situation is the 2008 episode, where the enormous percentage increase in spending would suggest a massive spending boost to the domestic economy in 2008, much greater in size than during 2010-2011 spending boost.

Year-on-year Spending changes (absolute)



Year-on-year Spending changes (percentage)



Source: Government Spending Transparency Portal and BCTL estimates

In fact, as will be stated below in this document and confirmed by economic investigation evidence up to now⁵, the inflationary episode of 2010-2012 was much more significant and broader than the episode

⁵ Recent BCTL’s investigation suggests that the 2011-2012 inflationary episode was much more widespread across the economy - affecting both food and non-food inflation - and due to a significant expansion of domestic economic activity than the earlier 2007-

registered in 2007-2008, as it reflects a wider and substantial boost in domestic economic activity, backed by a massive expansionary stance in domestic fiscal policy. This element reinforces our preference for using annual absolute changes, as a key metric to assess the relevance of various available economic time series as proxies for overall domestic activity, as it is less distorted by low starting points, so characteristic of many existing economic statistics.

Nonetheless, it should be noted that, in the future, as the room for expansion in fiscal policy is more curtailed, given financial budgetary restrictions, we increasingly expect to focus more on annual percentage variations, than absolute changes, converging with international standards in this field. Note also that our indicator, although computed based on absolute yearly changes, can also be used to infer annual percentage growth rates, as we do, later, in this document.

So as to close this methodological section, we end by stating our preference for the 4 quarters average to a 5 quarters centered average, as the first is more intuitive, more consistent with common metrics used for economic analysis and, fundamentally, does not lead to the loss of more recent observations, a fundamental restriction for our near-term economic activity indicator.

5. Selecting the relevant economic dataset

Given the mentioned metric to analyze historical and ongoing economic developments, we now detail the methodology used to build our activity indicator. This method, inspired in international best practice and bearing in mind Timor Leste's context, consisted of the following 3 steps:

- **Identifying a reference economic cycle series** - we chose domestic core inflation, estimated via median yearly inflation rates⁶, as our reference series for the cycle. The standard international practice is to use GDP or industrial production as references, but since we do not have up-to-date GDP data for Timor, we think that a broad and consistent measure of overall inflation pressures in our economy must be the best available proxy for the domestic economic cycle position. The idea is that core inflation will tend to rise as economic activity becomes more ebullient, especially if its dynamic is stronger than overall domestic supply developments. Although median inflation rate is not BCTL's main pick to gauge domestic core inflation, it has

2008 episode. This first inflationary episode was much more due to international commodities' price pressures and, on a lesser note, to the impact of social upheavels in the country in 2006-2007.

⁶ We refer the interested reader to BCTL's technical document on core inflation measures, which discusses the different metrics' respective advantages, disadvantages and interpretation.

- the advantage of being less influenced by international price pressures than other alternatives, thus providing a better guide to “home-grown” domestic inflationary pressures⁷.
- **Selecting the most relevant economic time series** - given our initial dataset of 39 series, we estimated the “statistical closeness” of each available series to our reference core inflation measure. We thus employed visual tests, correlation tests and subjective assessment to select the final set of more relevant series. An important weight was also given to selecting time series measuring developments in different economic sectors, so as to have a broader indicator.
 - **Combine relevant time series** - we found that 2 simple composite indicators computed by averaging relevant individual time series yearly changes, standardized, seem to be an adequate proxy of overall economic developments.

The analysis was carried out in a spreadsheet, where the statistical importance of each series was investigated using multiple metrics, to check our main assumptions. In particular, we used: different core inflation measures as reference, considered quarterly and yearly changes, experimented with having absolute or percentage changes, estimated correlations using nominal and real time series (deflated with different inflation measures) and tried to select the relevant series based on original quarterly values or using 4 quarters or 5 quarters centered averages.

In the end, we decided to propose 2 composite indicators: a simple one, employing only 4 variables; and a broader one, using 9 time series. The performance of both indicators is quite similar, but the broader indicator is more stable and employs more information. The “smaller” composite is easier to understand and easier to communicate. The table below presents the series used by each indicator.

Activity Indicators Subcomponents

Sector	Statistic	Sector	Statistic
Broad Indicator		Simple Indicator	
1. Imports	Construction Materials Fuels	1. Imports	Construction Materials
2. Public Expenditure	Major Capital Budget Total	2. Public Expenditure	Budget Total
3. Public Revenue	Taxes Total Income Tax	3. Public Revenue	Income Tax
4. Banking	Households Deposits Total Credit Payments Outflows	4. Banking	Total Credit

⁷ Note, however, that we experimented using other core inflation metrics as reference series, but the results do not change materially, in terms of selecting the best individual economic time series.

Both indicators employ series measuring developments for 4 sectors: imports, government spending, tax revenues and banking sector. The broader index includes 2 variables for each sector, using also, additionally, data for international payments (outflows). The smaller index includes only 1 series for each of the 4 sectors.

These indicators do a reasonable job in terms of tracking domestic cycle, as they: score high in terms of overall correlation with core inflation metric, measure developments in 4 different sectors of the economy and their historical pattern is consistent with economic theory and with economic evidence gathered up to now.

A final comment should be made as to justify the decision not to include any “hard economic activity variables” in both indicators, such as electricity consumption and production as well as vehicle registration. In fact, the problem with these “activity” variables is that they have a shorter sample than the rest, as most were only collected from 2007 and do not always correlate adequately with core inflation or the other relevant economic series. The only exception seems to be “commercial light vehicle registration” which correlates weakly with the benchmark inflation series. In our opinion, the weak link between these activity data series and broader economic cycle is due to the impact of public spending, that distorts overall vehicle registration data and, in the case of electricity, the fact that most consumers do not pay the full cost of electrical consumption, thus distorting their overall economic interpretation.

6. Compiling the Composite Indicators

Upon selecting the most relevant economic time series, we combine the more relevant variables for 2 composite indicators: 9 series for the broader indicator and 4 for the narrower one.

Combining the series corresponds to averaging the series’ year-on-year variations. The idea is that by averaging the various relevant economic time series we capture the overall business cycle trends, as the cycle corresponds to the general trend in economic activity across a broad set of economic sectors. This definition closely follows the concept proposed by Arthur Burns, former NBER’s chairman and President of the FED in the 1970s, which defined the economic cycle as⁸:

“Business cycles are a type of fluctuation found in the aggregate economic activity of nations that organize their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many

⁸ See seminal book on this topic published by Burns A.F. and Mitchell W.C., in 1946, entitled “Measuring Business Cycles”.

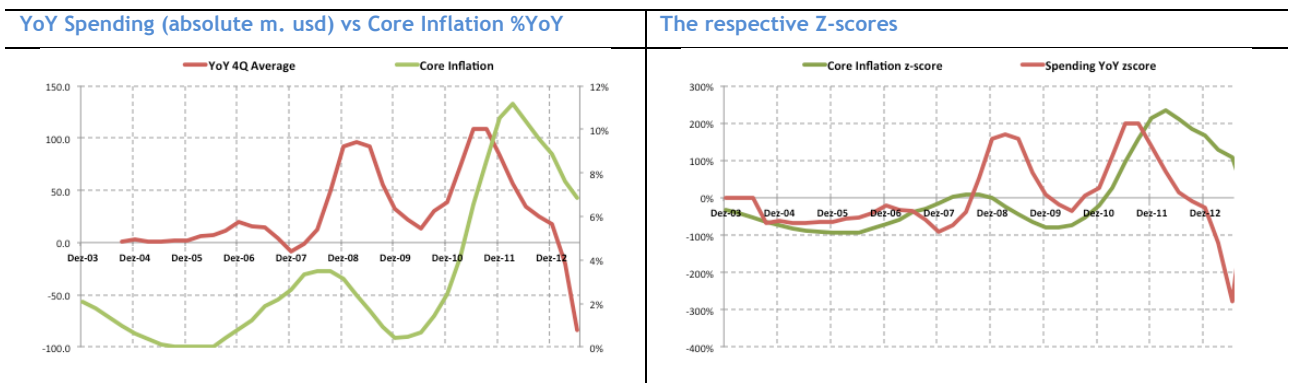
economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle.”

Burns and Mitchel, 1946

Nonetheless, given that the series are expressed in different scales - government expenditure is higher than credit values - and have a different degree of volatility - imports are clearly more unstable/volatile than, for example, public wage expenditure - we need to place the relevant series in the same “comparable scale”. We do this so as to avoid overweighting more volatile or higher scale variables, while compiling our indicators, thus treating all input series on the same basis.

The method used to achieve this “standardization” is commonly referred to as the “z-score” method. It consists in subtracting the average from each quarterly observation and dividing the series by its standard deviation. We thus create a new “standardized” variable, perfectly correlated with the original series, but with average 0, and standard deviation 1. The new variables are “scale free”, as they are expressed in percentage of the respective standard deviation. This very useful transformation allows a direct comparison of the correlation between the various series.

The pictures below illustrate this transformation and its usefulness. On the left picture, you may find yearly inflation rates compared with year-on-year changes in public expenditure. As they are expressed in different scales, you have to use 2 scales to compare the series. On the right side, we present the “z-scores” computed for the 2 series. As you can confirm, you need only one scale to depict both series.



Source: BCTL estimates

We thus calculated “z-scores” for all the relevant variables included in the 2 activity indicators, which were then computed as the average of individual “z-scores”. The economic interpretation of the indicators is relatively straightforward. It amounts to a percentage indicator of the position in the economic cycle. Assume for example, that the “z-score” for year-on-year public spending was 0% in June 2008. This means that this variable was equal to its global cyclical average, from 2004 until 2013, thus we could say the yearly change rate of spending was in a “neutral” position. Later, in March 2009,

the “z-score” jumped to 175%, which means that public spending was 1.75 standard deviations above the global “neutral” position, thus in a significantly “expansionary” position.

As we already said, our 2 composite indicators average the z-scores for the various relevant variables, which makes them aggregate z-scores for the domestic economic cycle. Although these are scale free variables, they help us position the economy in the global domestic cycle, which is expressed as a percentage of the cycle “standard deviation”. Note, also, that a z-score of “0” does not mean the economy is not growing, but is only growing at the same average rate of the global cycle.

We conclude this section with a relevant reference to the lags and leads between economic series and our benchmark, core inflation series. Some series in our dataset lead the cycle by up to 3 quarters - they anticipate a broad change in economic activity (here “proxied” by core inflation) 3 quarters in advance - while others coincide perfectly with the cycle. Since we include series with different lead/lag structures compared to the global cycle, we built our composite indicators by taking into account the lagging/leading elements of our dataset. This allows us to have composite indicators aligned with the core inflation metric used as benchmark. The table below presents the selected series for each indicator, with the respective leads/lags and correlation with core inflation.

Activity Indicators Subcomponents -

Sector	Statistic	Quarter Lead/Lag	Sector	Statistic	Quarter Lead/Lag
Broad Indicator			Simple Indicator		
vs inflation:			vs inflation:		
1. Imports	Construction Materials	2 quarters	1. Imports	Construction Materials	2 quarters
	Fuels	<i>2 quarters lag</i>	2. Public Expenditure	Budget Total	3 quarters
2. Public Expenditure	Major Capital	2 quarters	3. Public Revenue	Income Tax	1 quarter
	Budget Total	3 quarters	4. Banking	Total Credit	2 quarters
3. Public Revenue	Taxes Total	<i>coincident</i>			
	Income Tax	1 quarter			
4. Banking	Households Deposits	<i>coincident</i>			
	Total Credit	2 quarters			
	Payments Outflows	<i>coincident</i>			

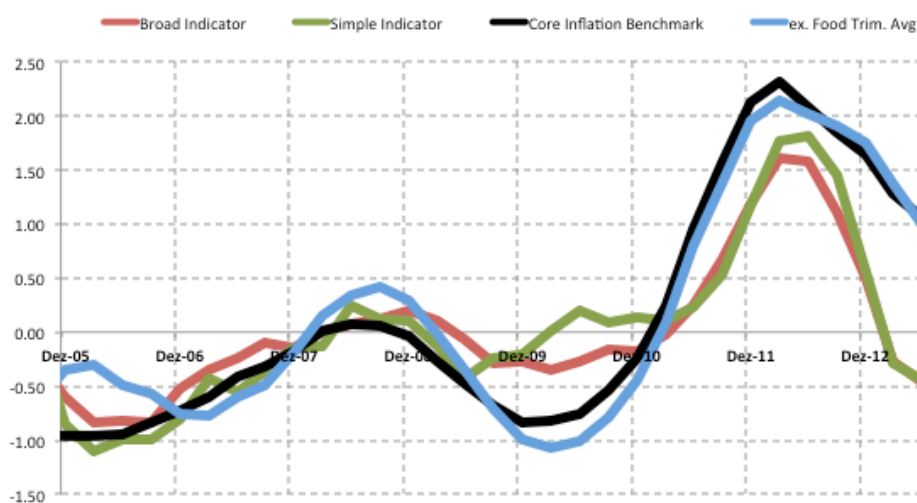
7. Using the Indicators

This section presents the results of our approach. The usefulness of these indicators is illustrated by comparing their historical pattern with overall inflation trends and with the available estimates for domestic non-oil GDP growth rates. In addition, we also try to understand the relationship between the indicators and the relevant economic data series and attempt to offer a simple and intuitive view of economic trends along the last years and the more recent developments.

a. Activity indicators are an adequate proxy of inflation trends

The chart below depicts both indicators, broad and simple composites, which were estimated using the methodology explained in this document. It also compares their historical pattern with 2 alternative metrics of core inflation, which we consider accurate benchmarks of overall inflation trends for our domestic economy. This picture shows that there seems to exist a strong connection between the indicators and inflation trends, as the z-scores of the 4 variables - based on absolute annual changes, for our activity indicators and annual percentage changes for inflation series - seem to follow similar paths from 2005 until June 2013.

Activity Indicators compared with core inflation metrics - presented as z-scores of year-on-year variations



Source: BCTL estimates

As you can see, the pick up in domestic price pressures tends to coincide with a boost of domestic economic activity, as inferred from the activity indicators. Note, however that we used median inflation rate as benchmark to select the most relevant variables and respective leads/lags, so this fact should already be partially expected. Nonetheless, the power of such relationship is certainly due to the economic logic that underpins our approach. The indicators are built by averaging annual changes across a broad set of economic variables, whose inclusion is not only validated by their statistical performance, but also by a strong economic rationale. As these indicators reflect broad trends across the various economic sectors, mostly related to aggregate domestic demand, we expect that, for example, a strong increase in domestic demand does result in increased inflation pressures, especially if the rise in demand is significantly above the capacity of the productive sector to accommodate such an increase.

A remarkable example of this argument is, evidently, the 2011-2012 inflationary episode, which we have already investigated in our previous core inflation paper. The strong price pressures evident for

the period - annual average inflation ascended towards 12% - seem to be the result of a massive and broad increase in overall domestic demand, as our indicators estimate that economic activity was growing 100%-150% above of what we might consider the historical average trend.

b. Simple and Broad Indicators have a close relationship

Another important remark should be made for the close relationship between the simple and broad composite indicators. As the chart above shows, the 2 indicators seem to follow an almost identical pattern throughout the available sample, although, at times, they do diverge slightly, such as in 2007 and 2010. This is an important conclusion, which means the much simpler indicator, based only in 4 core variables is enough to proxy overall developments, as tracked by our broader index, which uses 9 variables.

c. Indicators are an adequate proxy of GDP trends

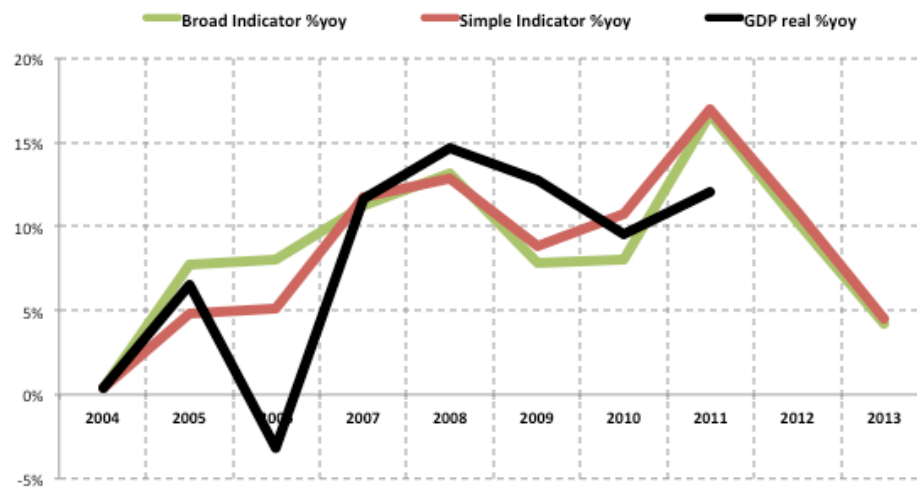
In another test of the reliability of our indicators, we compared the performance of our indices with the GDP official figures, compiled by DNE for the non-oil economy for the years of 2005 until 2011. Before we proceed to present the comparison, note that our indicators can be used to infer annual domestic activity growth rates, in a comparable scale to official GDP growth rates.

Our activity indicators are simple “z-scores” of annual rates of change for domestic activity and as such, are “scale free” or “normalized” indicators - with an average of 0 and standard deviation of 1. This property allows our indicator to be compared with any other relevant economic variable, being sufficient to rescale our index in terms of the scale for the benchmark series. Taking as base values the 2011 GDP value for the non-oil economy and the annual average and standard deviation of real GDP growth from 2004-2011⁹, we rescaled our indicators so as to express them in terms of annual inferred growth rates, in both absolute and percentage terms. The use of such simple rescaling allows us to express our indicator in terms of annual growth rates consistent with domestic GDP series’ scale.

The chart below presents the annual GDP real growth rates inferred from our indicators, with the official GDP growth estimates compiled by DNE. Note that we present the estimates for our indicators all the way through 2013, although the last official GDP estimate refers to 2011.

⁹ Note that we only have data for our indicators from 2005 until 2013. The estimates for 2013, were estimated using only data available until the second quarter of 2013.

Activity Indicators compared with historical GDP real growth rates - %YoY



Source: DNE (GDP real %YoY) and BCTL estimates

As you can see, our indicators do a relatively good job on terms of tracking annual GDP growth rates, as they mostly pickup the ups and downs of the cycle, while on the average, the estimates compare quite closely with official GDP growth rates. This is a significant confirmation of the usefulness of our indicators.

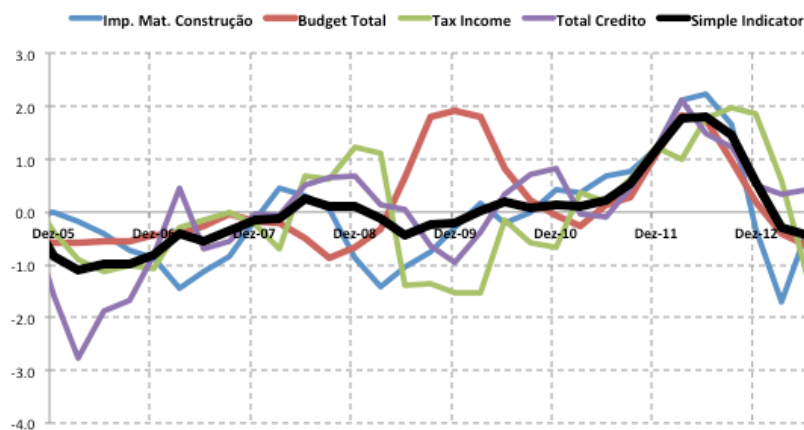
Note, however, that there are 2 years, where our indicators deviate considerably from official estimates: 2006 and 2011. As for 2006, this year was marked for considerable data uncertainty, as there are many missing monthly observations for 2006 for official statistics, which resulted from the social-political upheavals of that year. This fact may cause some divergence between the indicators and official estimates, as “missing data interpolation methods” surely diverge. As for 2011, official estimates put real growth at around 11%, whereas our indicators point to an extraordinary annual growth in economic activity of 17%. While we admit that our indicators are only a reasonable proxy of overall economic developments, when compared to the official and standard based GDP statistics, we observe that almost all the sub-components of our indicators point towards a substantial increase in 2011, which seems to be consistent with the substantial pickup in inflation for 2011.

d. Indicators and their subcomponents

Since our indicators result from the combination of various economic variables, which track developments for different economic sectors, it may be useful to compare the activity indicators with the respective sub-components in order to understand better the domestic economic cycles' breadth and magnitude. The chart below compares the simple activity indicator with its respective sub-components from 2005 up to June 2013. As can be seen, individual variables do not always follow the

same trends, diverging at times from other sub-components and also from the general economic trend, as proxied by the activity indicator.

Simple Activity Indicator vs subcomponents (lagged according to optimal correlation) - z-scores of Yearly absolute changes



Source: BCTL estimates

An important illustration of such illustration is the 2009 period, as public expenditure was growing significantly, whereas the 3 other subcomponents were either anemic or decreasing, thus causing the activity indicator - which averages the 4 variables - to register values of around 0%, that is a level consistent with a “neutral” or average position of the domestic cycle.

On the contrary, the situation registered in 2011-2012, shows that the pickup in public expenditure was also translated in a boost for imports, credit and income tax revenue. Given the significant increase in all 4 subcomponents it is no surprise that our activity indicator registered the highest score for the last 7 years, scoring almost 200% in 2012.

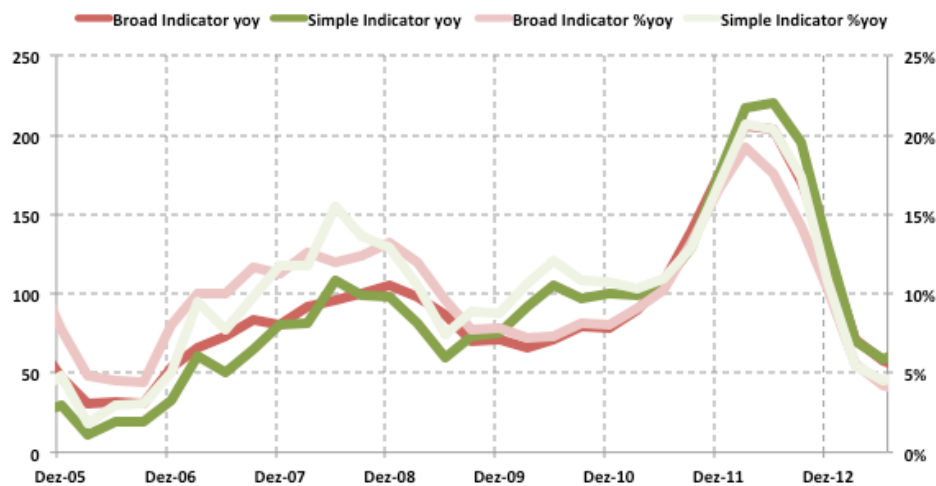
Interestingly, these 2 examples point towards an important and unexpected conclusion. It has been assumed up to now that domestic public expenditure is the single most important driver of domestic activity, whereas our analysis shows that this is not always the case. Actually, it seems that the impact of public expenditure in terms of economic activity is not only dependent on the size of the “fiscal envelope”, but also on its composition as well as private sector expectations and decisions, here proxied, for example, by the credit subcomponent.

e. Recent and near term economic and inflationary trends

We finish this section with a synthetic review of the most recent economic developments and offer some broad thoughts on the near term trends. The chart below exhibits the annual change for the broad and simple indicators, in percentage and absolute terms. As can be seen, the proposed indicators point to a significant softening of domestic economic activity in 2013 compared with 2012, to

a level consistent with 4.5% real growth in the 4 quarters ending in June 2013 - or 50 million USD on a real GDP 2011 basis. This economic slowdown has been more evident for income tax revenue, construction material imports and public expenditure, whereas domestic credit has been growing significantly in the last 4 quarters. The immediate cause of such slowdown seems to be the slowdown in public expenditure in 2013, which results from a low execution of the 2013 budget, which, in June 2013, amounted only to 19% of 2013 total budget expenditure. The execution rate has been particularly low for capital spending, at 6% of 2013's budget, whereas recurrent budget execution has been higher at 31% of budgeted expenditure. Although a more steep expenditure execution is expected into year-end, it will be difficult to reverse the economic slowdown evidenced to date in 2013, compared to 2012, for which the indicators recorded a real growth rate of 11%.

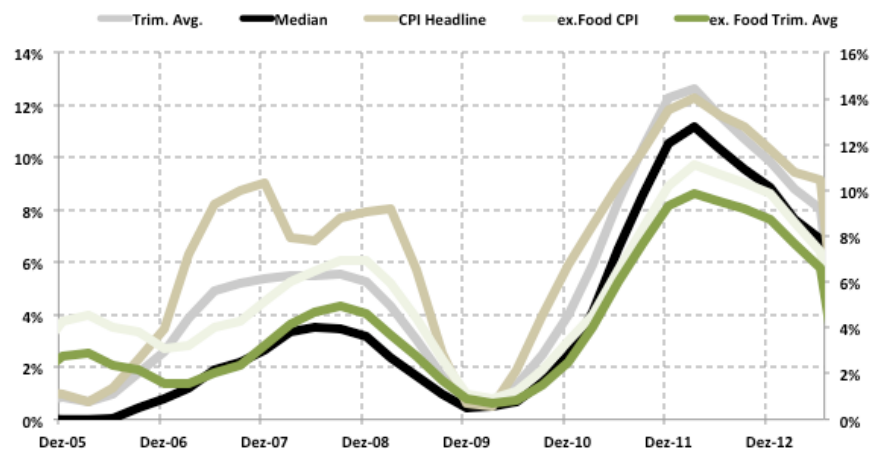
Simple and Broad Activity Indicators - 4 Quarters average Year-on-Year absolute and percentage changes



Source: BCTL estimates

Given this broad slowdown in economic activity, it should be expected a proportional decrease of inflation pressures for the domestic economy. In fact, as the chart below shows, inflation has indeed come down from its 12% peak, registered for the 4 quarters ending in March 2012.

Inflation Indicators - 4 Quarters average of Year-on-Year percentage changes



Source: DNE data and BCTL estimates

The slowdown in inflationary pressures is evident for all inflation metrics depicted in the graph, which include headline CPI inflation and 4 alternative metrics of core inflation, specifically: median and trimmed average inflation rates, and non-food CPI based and trimmed mean inflation rates. Nonetheless, it should be noted that the decline in inflationary pressures has been slow and small, compared to the slowdown evidenced for domestic economic activity, as tracked by our activity indicators.

This important observation seems to point towards the existence of “nominal/price rigidities” in our economy, which have not allowed inflationary pressures to track the slowdown in domestic activity. Although it is difficult to offer robust explanations for this phenomena at this point, we may be entitled to suggest that high inflationary expectations for consumers and companies, ingrained by the inflationary episode of 2011/2012, as well as the existence of significant logistic bottlenecks in our economy may be the proximate causes of this problem.

In case these factors do prove themselves to be true, we could argue that a broader and longer “policy induced” economic slowdown may be needed to erase inflationary pressures from the economy. Note also that inflationary pressures are generally caused by increases in domestic demand in excess of aggregate supply capacity growth. Considering this element might suggest that a policy induced slowdown or a developmental policy especially targeted at raising domestic production levels, or optimally a mix of the two policies, should be recommended for policymakers truly attuned to keeping inflation low and stable, especially given the inexistence of monetary or foreign exchange instruments to manage the domestic economic cycle.

8. Conclusions and further steps

We hope that this work and its respective proposed indicators might, at a minimum, complement existing statistical tools to track and analyze domestic economic developments. This objective is especially relevant for BCTL's Economics Division, which has been gradually upgrading its statistical and analytical framework to provide more informed and relevant contributions to economic monitoring and macroeconomic policy design and assessment. As already stated, on top of this internal considerations, we hope that this simple proposal might also be analyzed and discussed with other relevant policymaking institutions and interested public so as to upgrade the level and depth of current economic debate.

As the document shows, the two activity indicators allow us to track economic trends in a real-time basis - as soon as quarter data is made available - for the overall domestic economy and various economic sectors. This very useful property than can be used to proxy overall GDP growth rates, complementing official estimates compiled by DNE, allowing us to have an earlier and up-to-date quarterly estimates of economic growth rates, which are fundamental for understanding ongoing and near term economic trends. We hope that this real-time nature can better inform policymaking decisions, such as the deciding on the size of "fiscal envelope", its composition and other relevant macroeconomic policies and respective impacts. As the document shows, the indicators can help us assess the economic impact of public expenditure on a global and sectorial basis and, consequently, its relevance towards understanding the inflationary process of the domestic economy.

This proposal is, nonetheless, only a first and simple approach towards assessing real-time economic trends, which we do intend to develop further, so as to reinforce its general usefulness and understanding. In terms of future relevant developments that could be pursued in this context, we envision the following:

- **broaden the indicators** - assess the possibility of including other existing statistics - such as electricity consumption, vehicle registration, airport and port activity - in the calculation of the indicators, so as to broaden their profile. Eventually, incorporate new sectorial statistics, that may be compiled in the future, on a quarterly basis, by DNE;
- **review its usefulness** - continue to monitor the indicators and their relevance in terms of explaining broad economic trends, comparing, for example, their correlation to official GDP estimates and domestic prices developments;
- **economic monitoring** - incorporate the indicators and respective constituents in BCTL's reports to monitor ongoing economic developments and facilitate public understanding and awareness;
- **economic forecasting** - use the indicators and available information to forecast economic developments for the year ahead. This may include projecting overall GDP and economic activity growth rates as well as economic developments for fundamental economic sectors;

- **fiscal policy economic assessment** - given the current importance of Public Sector's decisions, specifically of the fiscal policy decisions, in terms of the overall domestic economic performance, the indicators could be used to quantify what is generally known as the "fiscal multipliers", or the impact of fiscal policy decisions - size and composition of public expenditure and fiscal revenue policies - in terms of the domestic economy;
- **inflation modeling and forecasting** - naturally, these indicators could be used to enhance the inflation models currently used at the BCTL, to better incorporate the impact of domestic economic developments in terms of historical and projected inflation trends. This would allow us to have a globally coherent macroeconomic framework to understand the domestic economic structure and forecast relevant economic developments.

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