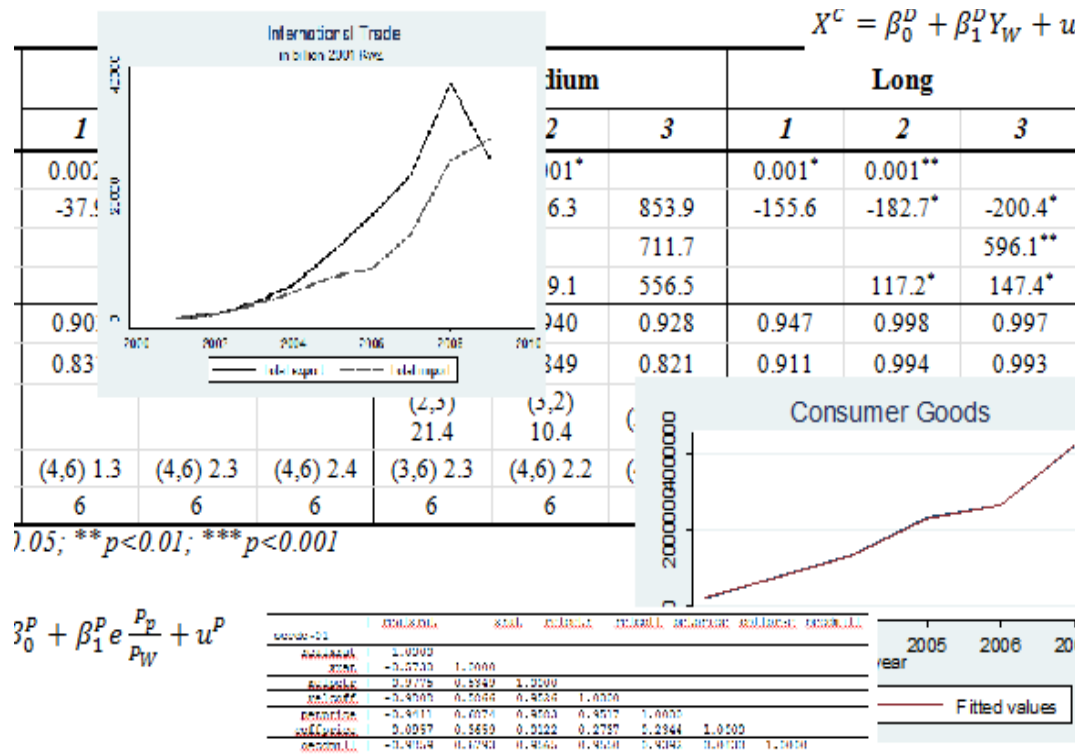


ANGOLA BRIEF

May 2011 Volume 1 No.11

MODUCAN

The construction of a macroeconomic model for Angola: challenging and rewarding



Many variables must be taken into account when developing an economic model. (image built with elements from MODUCAN)

$$\beta_0^P + \beta_1^P e^{\frac{P_2}{P_1}} + u^P$$

Variable	2005	2006	2007	2008	2009	2010
Interest rate	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Exchange rate	0.2775	0.2849	0.2924	0.2999	0.3074	0.3149
Real GDP	0.2800	0.2800	0.2800	0.2800	0.2800	0.2800
Real wages	0.2800	0.2800	0.2800	0.2800	0.2800	0.2800
Real interest rate	0.2800	0.2800	0.2800	0.2800	0.2800	0.2800
Real exchange rate	0.2800	0.2800	0.2800	0.2800	0.2800	0.2800
Real consumption	0.2800	0.2800	0.2800	0.2800	0.2800	0.2800

A macroeconomic model provides an analytical framework to describe the structure and behavior of the economy. Knowledge of the mechanisms at work provides a basis for discussing government policies and creates a demand for access to information and data. This implies that the model can be useful in terms of strengthening civil society in Angola. However, the construction of MODUCAN has proved a time consuming and difficult task, particularly because of the restricted access to data. The full dataset for the model as it stands today has been accessible only for the years 2002 through 2005. Thus, at this point in time we are left with the structure for a model and a potential that has not been completely realized. The data needed to improve the model exists, but has not yet been made public by the government.

CURRENT AND FUTURE BENEFITS

Originally, the aim was to make the model operational and to produce forecasts for the development in GDP, interest rates and exchange rates by 2011. There was also a planned expansion of the model to forecast the development in prices (inflation). However, the construction of MODUCAN has been slowed due to problems with data collection. Still, a structure for the model and a tool for making forecasts in excel have been set up. We have also created a framework for identifying

empirical relationships in the Angolan economy using the statistical software STATA. Once the relevant data is made public, the model will be ready to be put in use for making forecasts about the Angolan economy. The work undertaken to determine the model has, however, already provided insight into the Angolan economy.

Our work suggests that the import of consumer goods is not very sensitive to changes in prices. The same is true of

THE AUTHORS

Line Skadelbø economist and PhD researcher at CMI.

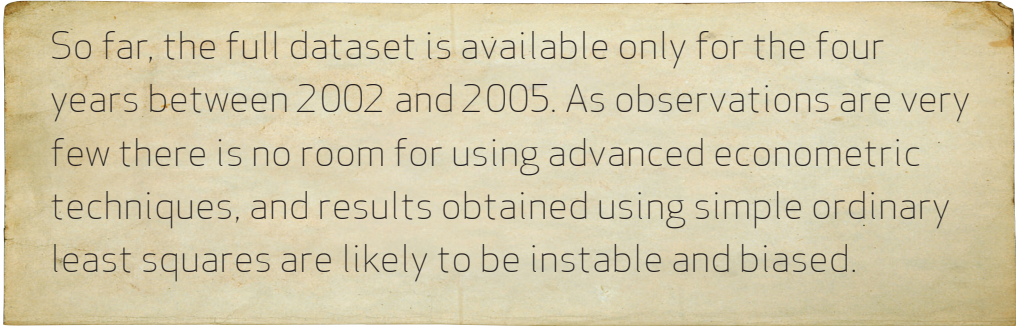
Alves da Rocha economist and director at CEIC.

the export of coffee and other goods from Angola. This finding likely reflects capacity constraints in the Angolan economy. Even as imports become more expensive, there is no shift towards domestically produced goods because not enough are produced to meet demand. Also, when the international price of goods produced in Angola increases, exports do not increase much. Capacity constraints in the economy do not allow for an increase in supply. These capacity constraints point to the need for diversification of the Angolan economy. This is an issue that CEIC and CMI will be working on in the next phase of the cooperation program.

The model will be used to improve forecasts in the "Relatório". Using MODUCAN, CEIC will be able to create different scenarios to address the effect of changes in government investment rates or consumption, for example. As the model develops further, it can also be used to assess the development of the manufacturing sector in the shadow of the petroleum economy. A simplified version of the model will also serve as a training tool at the UCAN, strengthening the competence of future economists in macroeconomics. Part of the work for the model has been to provide courses in the use of statistical software and economic modeling to university and ministry staff.

It can be used to assess the consequences of changes in exogenous variables, that is, changes in variables that cannot be determined within the model. For Angola, the effect of changes in oil prices would be of particular interest. The model can also be used to assess the effects of policy choices made by the government.

As the base of the macroeconomic model there is a theoretical description of the mechanisms at work and the behavior of economic agents. The theoretical model provides a frame within which the empirical relationships can be identified and described. MODUCAN is based on the IS-LM-BP framework for an open economy. The IS-LM framework was developed to explain the Great Depression in the US in the 1930s. The Great Depression was an economic downturn that could not be explained by fluctuations in aggregate supply caused by changes in production, capital, labour or technology. Keynes argued that a fall in aggregate demand caused this sudden economic downturn and focused on the role the government could play through fiscal and monetary policy. The Keynesian IS-LM-BP framework is still commonly used for analysis of fiscal and monetary policy.



So far, the full dataset is available only for the four years between 2002 and 2005. As observations are very few there is no room for using advanced econometric techniques, and results obtained using simple ordinary least squares are likely to be instable and biased.

BACKGROUND

Here we briefly present the background against which the work with MODUCAN was initiated and the selection of a theoretical framework.

In Angola, economic modeling is still in its beginning stages. As far as we are aware, the only model with broad coverage is the MODANG, which has been in use for a number of years in the Ministry of Planning. There is also a new model of the petroleum sector underway that will be used in the Ministry of Finance.

WHAT IS A MACROECONOMIC MODEL?

The goal of a macroeconomic model is to replicate the main mechanisms of an entire economic system. It is a simplified representation of real world processes and relationships. The macroeconomic model provides an analytical framework describing the structure and behavior of the economy.

THE STRUCTURE OF MODUCAN

The structure of MODUCAN consists of three markets: the market for goods and services (IS), the money market (LM) and the market for foreign exchange (BP). Equilibrium is reached by adjustments in income, the interest rate and the exchange rate.

The goods market (IS) is described by the National Income Identity in such a way that GDP equals total consumption plus total investment and total trade (export minus import). Government investment and government consumption are determined exogenously while we specify functions for private investment, private consumption, export and import. The money market (LM) is described by the supply of money being equal to the demand of money. Money supply is given exogenously while money demand is affected by inflation, GDP and the interest rate. The market for foreign exchange is determined by the capital

account and the current account. The model is demand driven and assumes that whatever is demanded will be supplied. The supply side does not play any role, and there is no room to address capacity constraints. However, it is possible to extend the basic model to incorporate the supply side at a later stage.

There are two main approaches to constructing empirical macroeconomic models. First, one can use econometric techniques and analyze historical data. This kind of analysis provides an overview of the specific relationship between economic variables in the economy. For example, an econometric analysis will provide insight into what the effect of a change in income or interest rate will have on private investment in an economy. The variables that measure the size of these effects are referred to as the parameters of the model. Econometric techniques range from simple ordinary least squares to far more sophisticated techniques. The more sophisticated techniques are used, the longer time series of data one needs. The second approach is to draw on existing empirical research and fix key parameters at values that are considered reasonable on an a priori basis. This means that the size of the parameters will be determined by theory or by considering parameters identified for similar economies. Also, one might calibrate parameters by fitting them to observations from specific years.

Our approach is to use a combination of these two techniques. We run regressions using the data available. In some cases there are only 4-6 observations, making it hard to get significant results. Therefore, we also base our parameters on calibration, and fit parameters to real data for 2005. Although data availability poses serious constraints, we have produced initial estimates of all the parameters used in the model. The estimations of parameters for MODUCAN are made using the statistical software STATA. The parameters are then placed in Excel spreadsheets that are used to run MODUCAN. At this initial stage, the model is highly aggregated and we have estimated/calibrated some 15 equations. As more data becomes available, further disaggregation of the model will be desirable.

So far, the full dataset is available only for the four years between 2002 and 2005. Thus, it is difficult to say much about the model's performance. The restricted dataset has a real impact on the quality of the model. As observations are very few, there is no room for using advanced econometric techniques, and results obtained using simple ordinary least squares are likely to be unstable and biased because we are not able to control properly for the data's time series characteristics.

SUMMING UP

The construction of a macroeconomic model for Angola has proven time consuming and difficult due to problems with data accessibility.

However, the potential benefits from undertaking the task of making MODUCAN run suggest that the work is worthwhile. There are benefits in terms of strengthening civil society and building capacity in economic analysis, modeling and the use of new software. In the future, there will be a need for a continuous effort to collect data and to upgrade econometric modeling skills. Finally, the model itself should be expanded and improved. The model itself should be expanded and improved.

The Angola Brief series is an output of the CEIC-CMI Cooperation Programme for research in social and economic issues concerning Angola. The series aims to contribute research findings and policy recommendations to enhance public debate in and about Angola.

Editors: Alves da Rocha & Aslak Orre

Authors: Line Skadelbø, Alves da Rocha

MODUCAN

The work with constructing a macroeconomic model, MODUCAN, for the Angolan economy was initiated as part of the cooperation program between CMI and CEIC in 2008.

FOR MORE INFORMATION VISIT
THE CEIC-CMI COOPERATION
PROGRAM WEBSITE
www.cmi.no/angola

ISSN 1892-3933

CMI (Chr. Michelsen Institute)

Bergen - Norway
Phone: +47 47 93 80 00
E-mail: cmi@cmi.no
www.cmi.no

**CEIC (Centro de Estudos e
Investigação Científica)**

Universidade Católica de Angola
Phone: +244 922 280 541
E-mail: ceic.ucan@gmail.com
www.ceic-ucan.org