

Appendix V

EIC MACROECONOMIC MODEL

The EIC Macroeconomic Model for Cambodia

A Brief Methodological Note

The EIC macroeconomic model is an annual-frequency supply model, using Microsoft Excel as software support. Its main feature is to produce consistent economic medium and long-term forecasts, which fundamentally depend on the policies and strategies to be implemented, and the behavior of the economic agencies, in accordance with the external environment and internal political developments.

Technically, it depends primary on the main assumptions (exogenous variables) on the social and political environment in the country, and also the international environment as the Cambodian economy is largely an open economy. More concretely, as the model is a supply model, investment is the key factor for country's economic development.

In general, the model's behavioral equations are econometrically estimated and fundamentally rely on the quality of the historical data. However, as the quality of statistics in Cambodia is very weak, the number of behavioral equations in the model is limited, and many are in general pre-determined.

Economic Database

While the quality of the model's underlying database is continuously under improvement, it covers a large range of Cambodian economic and social indicators. It includes business accounts, some elements of household accounts, the national budget, the monetary survey, the balance of payments, employment, and investment. Data are available from 1960 to 1970 and from 1985 to the present. Data of the period 1960-70 were published by the IMF and the World Bank and presented in a book written by a French expert. It is recompiled to be consistent with the new nomenclature (2000 price basis) and its quality is fairly good. Data of the period 1985-93 are roughly estimated from various government sources. Its quality is medium. Concerning 1994 to the present, the economic data is more available and the quality is relatively good. The list of these data is available on request.

The Business Accounts cover 22 sub-sectors, including agriculture (6 sub-sectors), industry (9 sub-sectors), and services (7 sub-sectors). For each sector, there are about 20 economic variables calculated, including: (i) Supply and Demand at current prices and at 1993 prices (Production, Consumption, Investment and External trade of goods and services), (ii) Business operating accounts (value added, salary, potential contribution to the national budget, gross profit and investment), (iii) Other accounts (employment, productivity, average monthly wage).

The Household Accounts cover the total household revenue and monthly wages by major category of profession (rice farmers, non-rice farmers, factory workers, civil servants and others). These accounts are compiled from the national accounts and the socio-economic surveys of the Ministry of Planning.

The Public Administration Accounts cover the national budget operations compiled by the Ministry of Economy and Finance. It includes a large range of revenue components, expenditure by category of spending (investment, salary and other operating costs) and by major category of ministry (civil administration and defense and security), sources of deficit financing

The Financial Institution Accounts are represented by the monetary surveys compiled by the National Bank of Cambodia. This includes main monetary aggregates, such as liquidity (in riel and US dollar) and credits.

The External Accounts reflect the balance of payments (BOP) data compiled by the IMF, the National Bank of Cambodia and EIC, based on the above business accounts (external trade and foreign investment by sub-sector). It includes a large range of external trade, services, private income movements, foreign aid and capital transactions with the rest of the world.

Other Accounts include the labour force and employment, which are roughly estimated from the 1998 census and various socio-economic surveys of the Ministry of Planning.

Economic Modeling

The model is a supply model, assuming general equilibrium in terms of goods and services, labour force and employment, and money supply and credit. Investment plays the most important role in the model. The main exogenous variables are the international environment (foreign direct investment, foreign aid, export of garment products, number of tourists visiting Cambodia, and prices of agriculture commodities and manufacturing goods in the world markets) and real commitments of the government on reforms that are represented mainly by the effectiveness of the government in collecting taxes and the amount of foreign aid disbursements. The model covers thousands of variables, most of which are calculated by identity or pre-determined equations, so this section only deals with the general structure of the main equations. More explicit and detailed equations are available on request.

The Cambodian economy can be split into two main categories: the traditional sector and the modern sector. The traditional sector covers mainly agriculture, handicrafts, domestic trade, real estate, and other small services. The modern sector has been developed

rapidly only after the Paris peace agreement in 1991. From 1992 to 1993, most investment went to hotel, restaurant and real estate sectors. From 1994 to 1995, some modern manufacturing and service sectors started to develop, mainly in the food industry and gasoline distribution. It is only after 1995 that the garment industry, transportation and telecommunications, and the tourism industry showed a significant expansion.

The economic growth of the traditional sector largely depends on population growth, while that of the modern sectors is linked largely to foreign direct investment (FDI) and external demand, which are exogenous and depend on the political stability of the country and performance of economic and institutional reforms of the government.

For these reasons, the Production Functions of the model largely depend on investment (private and public) and past long-term trends.

Specifically, the production of the agricultural sector (excluding livestock, fishery and forestry) relies on the area of cultivable land and its productivity, which depends on past trends and the amount of new investment (private and public) in the sector. Production of livestock is linked to the population growth, while production of fishery and forestry is exogenous and depends on the success of government reform policies on natural resource management.

Concerning the industry sector, the production of manufacturing depends on private investment and market demand (domestic and external), while the production of public utilities (electricity and water) is linked to the public investment in those sectors. Production of construction (residential and non-residential) relied on the investment.

Regarding the service sector, the production of the transport and trade sectors depends on the production of the agriculture (excluding forestry) and manufacturing sectors, and the level of imports of consumer goods. Production of the tourism sector (hotels and restaurants mainly) is linked to the investment in these activities, while the production of real estate and other services is directly linked to population growth.

Inflation (in riel) in the model is linked to the price of imported goods (in riel) and the trend of worker productivity. In general, Cambodia consumes local agriculture products, and imports manufactured goods. As the country becomes more and more open, the prices of local agricultural products, particularly rice, align with the world market prices. It is also noted that the garment industry, which represents about 70% of the manufacturing sector (in terms of nominal valued added), almost totally exports its production.

The Exchange Rate (riel against the US\$) is exogenous, technically. But in fact, it depends on the level of bank financing in riel to the budget deficit in the forecast period.

During past periods, one billion riel of budget deficit financed by the Central Bank resulted roughly in a depreciation of the riel of about 10 riels per US dollar.

The money supply (in riel and in foreign currencies) is linked to nominal GDP, while credit relies on bank deposits (money supply in foreign currencies).

The National Budget projection largely depends on economic activity trends and government's fiscal policy (the official tax rate and government performance in tax collection).

Specifically, budget revenue is linked to the amount of potential tax payments by each economic sector and the performance of the government in effectively collecting this tax. For each sector, the amount of potential tax payment is calculated by multiplying the official tax rate by the amount of value added or profits or salaries paid by the companies, depending on the categories of tax. Government performance in tax collection is represented by the ratio of the "amount of tax collected effectively from past budget data" to the above "potential tax payment". The official tax rates and government performance in tax collection are exogenous and fundamentally depend on the government's fiscal policy. For example, the revision of the investment law by removing some tax incentives might raise the government performance in tax collection.

On the expenditure side, the model separates public investment from government salaries and other operating costs. Salaries are linked to the number of public administration staff (exogenous) and the level of monthly wages that depends on the economic growth and inflation, while other government operating costs are linked to the budget revenue. The budget deficit is exogenous, and as a result, public investment is the balance between revenue, current expenditure and public deficit.

The Balance of Payments projection depends on external trade and the exchange of services of each sector. Foreign aid and foreign direct investment (the main components of the capital accounts) are exogenous and rely on government's success in implementing reform policies. Since 1999, donors mostly linked their assistance to the performance of the government in terms of reforms. In addition, as the Cambodian economy is strongly dollarized, the private sector (business and households) freely owned foreign currencies.

For this reason, the balance of payments in the model also considers the foreign currencies owned by both the Central Bank and the private sectors. With regards to trade, the imports of goods depend directly on demands of each sub-sector (intermediate consumption, final consumption and investment), while exports are just the balance between supply and domestic demand. Trade in services mostly depends on foreign tourism activity.

Investment includes four components. As stated above, private foreign investment and public investment financed by foreign aid are exogenous. However, public investment financed by domestic revenue is calculated in the national budget section as the balance between government revenue and current expenditure, while the private investment locally financed is calculated for each sub-sector in the business account section and mostly depends on profits accumulated during the previous three years.

Employment of each sub-sector is directly calculated from the level of valued added at constant prices and the productivity of worker, which is determined by past trends. It is noted that the workforce in Cambodia is very underemployed, especially in the informal economy. The productivity of workers thus fluctuates greatly.

Wages of workers are also directly derived from the productivity of worker and inflation rates.

