Economic Modelling in IRAN, and SDGs Implementation in 2030 Agenda

A REVIEW OF MACRO-ECONOMETRIC MODELING EXPERIENCE

Ministry of Economic Affairs and Finance
Deputy of Economic Affairs - Modeling and Management Office
introduction

- Forecasting economic development, is one of necessities for economic planning and implementing appropriate policies.
- For this purpose, economic decision-makers use economic quantitative models to analyze the existing situation, to picture the ideal situation, and to analyze, evaluate and predict the impact of macroeconomic policies.
- Over the past few decades, different organizations and entities engaging in economic decision-making, have been designing and using economic models, due to their institutional mission.
- Also, Academics and economic experts has designed various economic models to fit their scientific concerns or short-term requirements of the country.
# Main Institutions Engaged in Economic Modelling

The main economic modelling institutions, and the most important models implemented in Iran are as follows:

<table>
<thead>
<tr>
<th>Ministry of Economic Affairs and Finance</th>
<th>Management and Planning Organization</th>
<th>Central bank</th>
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</thead>
<tbody>
<tr>
<td>• I-O &amp; SAM</td>
<td>• Macro econometrics</td>
<td>• Financial Programming</td>
</tr>
<tr>
<td>• CGE</td>
<td>• DSGE</td>
<td>• Sectorial econometric models</td>
</tr>
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<td>• I-O</td>
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</tbody>
</table>
Economic Models in Iran

**INPUT-OUTPUT MODEL**

The first experimental and preliminary input-output table of Iran economy was developed by the Ministry of Economy in cooperation with Wassily Leontief and Prasanta Chandra Mahalanobis, in 1962. The latest statistics input-output table is for 2011.

The input-output model has been used to rank and analyze the impact of the manufacturing sectors, employment, price shocks, backward and forward linkages and to identify key areas of economy, and for environmental surveys.

**SOCIAL ACCOUNTING MATRIX**

Social Accounting Matrix for Iran economy was developed by Pyatt and others, using data from 1970, after requisition of Iran's government from International Labor Organization. The latest social accounting matrix is for 2011.

Social accounting matrix is often used to rank and analyses the impact of policies on production, employment, income distribution, price shocks, and to structural path analysis and in supply constraints models.
Due to the superior position of general equilibrium models to partial equilibrium models, a Computable General Equilibrium model is used to evaluate the effects of economic policies like subsidies targeting, on economic growth and welfare. The current model has 21 manufacturing sectors, which supply 23 groups of commodities and service, and is built based on the 2001 social accounting matrix of Iran economy. GAMS software is used to solve the model.

The DSGE model designed in Ministry of Economic Affairs and Finance of Iran, is an open dynamic stochastic general equilibrium model in which the export-import and currency rate is modeled. Also, to have a better explanation of empirical data in the model, some frictions such as sticky prices and wages in different markets is implemented in the model.

This model features a wide range analysis including structural supply shocks (such as productivity shocks), the demand side shocks (such as consumer preference shock, investment adjustment costs function shock, government spending and the demand function for money) and finally, monetary policy and exchange rate shocks.
Econometric Models

A. Sectorial models

- **Estimation Method:** VECM-Cointegration
  - Oil Revenue
  - Base Money
  - Nominal Exchange Rate
  - GDP Gap
  - Seasonal Forecasts of Consumer Inflation

- **Estimation Method:** Markov-Switching
  - Oil Revenue
  - Base Money
  - Inflation
  - Real Exchange Rate
  - Investment in Construction
  - Seasonal Forecasts of Expansions and Recessions

- **Estimation Method:** S-Cointegration
  - Oil Revenue
  - Base Money
  - Inflation
  - Real Exchange Rate
  - Investment in Construction
  - Seasonal Forecasts of Economic Growth

- **Estimation Method:** ARIMA-GARCH
  - CPI (Consumer Price Index) and Its Components
  - PPI (Producer Price Index)
  - Monthly Forecasts of Consumer Inflation and Its Components
  - Monthly Forecasts of Producer Inflation
Econometric Models

B) Macroeconometric Models

- Development of macroeconometric models in Iran began after the calculation of national accounts after World War II. When a short time series of national accounts was provided in 1968, the first macro-econometric model for Iran Economy was created by the United Nations Conference of Trade and Development (UNCTAD).

- UNCTAD's macro-econometric model was the beginning of modeling experience in Iran, and since then numerous modes is built with different objectives for the economy. In general, these models can be divide into two categories. The first category are models which is developed by domestic or international organizations, like the (former) Management and Planning Organization of Iran, the Central Bank of Iran and the World Bank, aiming to planning and economic policies-making. The other category are models which is developed as a master's or doctoral theses by students at universities inside and outside of the Iran.
In the literature of macro-econometric modeling in Iran, apart from models developed by academic professors, about 16 structural macro-econometric models have been built by different organizations, in which the most important models are as follows:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Purpose</th>
<th>Theoretical</th>
<th>Estimation Method</th>
<th>Number of Equations</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Bank (1991)</td>
<td>The first five-year development plan</td>
<td>Neo Keynesian (AD-AS)</td>
<td>2SLS + OLS</td>
<td>20</td>
</tr>
<tr>
<td>Ministry of Economic Affairs and Finance (1994)</td>
<td>Structural Analysis and evaluation of economic policies</td>
<td>Neo Keynesian (AD-AS)</td>
<td>2SLS - OLS</td>
<td>56</td>
</tr>
<tr>
<td>Management and Planning Organization of Iran (1994)</td>
<td>The 2nd five-year economic development plan</td>
<td>Keynesian and Supply Side</td>
<td>OLS</td>
<td>78</td>
</tr>
<tr>
<td>Central Bank of Islamic Republic of Iran (1997)</td>
<td>Analysis of the impacts in economic policy changes</td>
<td>Keynesian-Monetarism</td>
<td>OLS</td>
<td>60</td>
</tr>
<tr>
<td>Institution</td>
<td>Purpose</td>
<td>Theoretical</td>
<td>Estimation Method</td>
<td>Number of Equations</td>
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<tr>
<td>----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------</td>
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</tr>
<tr>
<td>Central Bank of the Islamic Republic of Iran (CBI)-Monetary and Banking Research Institute (2003)</td>
<td>Analyze the impact of scenarios and forecasts</td>
<td>Keynesian</td>
<td>OLS</td>
<td>200</td>
</tr>
<tr>
<td>Ministry of Economic Affairs and Finance-Iranian National Tax Administration (INTA) (2008)</td>
<td>Analyze the impact of economic policies on macroeconomic variables, especially tax revenues</td>
<td>Neo Keynesian-Neoclassical</td>
<td>Cointegration</td>
<td>84</td>
</tr>
</tbody>
</table>
Using the Past experiences, Ministry of Economic Affairs and Finance as one of the most important economic policy makers, decided to design and develop the "Macro-econometric Model of Iran Economy", which aims to use the capabilities of the model for "studying the interaction between variables, policy analysis and forecasting macroeconomic variables". In designing this model, the focus was on goals, duties and missions of the ministry, and the policy tools which this ministry has access to.

**According to Article 1 of the Act** of establishing the Ministry of Economic Affairs and Finance (approved in 1974), "Setting the economic and financial policies, making financial arrangements, implementing tax policies and planning economic cooperation and mutual investments with foreign countries" are the establishment goals of this ministry. Therefore, the Ministry of Economic Affairs and Finance is considered the most Important state authority in the field of fiscal policy. According to the country's macroeconomic structure and relationships between sectors, different expansionary and contractionary financial policies, have different effects on the economic variables and economic indicators, at different times. So, knowing the impact of this policies is of particular importance to the ministry.
Inputs:
- Providing macro-econometrics modeling history
- A review of the structure of Iran’s economy
- Identifying policy needs and means of the Ministry of Economic Affairs and Finance
- Explain the main elements of macro-econometrics model for Iran
- Collecting macro econometric data bank

The main processes:
- Identifying estimation method
- Identification test
- Estimation of parameter
- Diagnostic tests
- Prediction of endogenous variables of the model
- Validation of estimated equations

Outputs:
- Estimated equations
- Statistical properties of equations and descriptive statistics
- Model simulation
- Policy analysis and external shocks
- Forecasting
Modeling Macroeconometric Model Based on 6th Development Plan Targets and SDGs

1. Design Model Bases Block Approach
2. Separate Estimation Blocks
3. Econometrics tests
4. Design of national account equation
5. Making Macroeconometric Model of IRAN
6. Policy assessment
7. Sensitivity Analysis
8. Forecasting

- Medium Scale
  - 59 Endogenous Variable
  - 78 Exogenous Variable

- Iran Economy
  - Aggregate Demand
  - Fiscal
  - Prices
  - External
  - Aggregate Supply
  - Monetary Market
  - Labor Market
Economy at a Glance

**Labour Market**
- Economic participation rate
- Population aged between 10 and 64
- Unemployment rate

**Goods and Services Market**
- Agriculture
- Oil
- Manufacturing and mining
- Services

**Monetary Market**
- Monetary Base
- The money multiplier
- Liquidity

- Change in inventories
- General price level
- GDP
- Private consumption expenditures
- Investment
- Public consumption expenditures
- Net Exports

- Goods and Services Market
- Monetary Market
- Labour Market
Simulation

Value Added

CPI Index

Labor Force

Capital

PCI (Baseline)

PCI

L (Baseline)

L

K (Baseline)

K
MODELING SUSTAINABLE DEVELOPMENT GOALS FOR IRAN AND ESCAP IN 2030 AGENDA
Global goals for sustainable development in Iran

In accordance with 17 goals of SDG, the ministries and agencies who are responsible or main co-worker for each goal has been marked.

Ministry of Economic Affairs and Finance has been set responsible for goal number 8 and 10 and main co-worker for goal number 1.
SDG indicators in Macroeconometric model of the Ministry

• Given the 5-year development plans in Iran, SDGs in three 5-year plan can be scheduled.

• Ministry of Economic Affairs and Finance has responsibility in goals 1, 8 and 10.

• The most Important Indicators for mentioned goals are economic growth, inflation, unemployment, total factor productivity and the Gini coefficient.

• Using the Macroeconometric Model of the Ministry, and SDG in mind, quantitative targets have been set for indicators mentioned above, in the period 2016-2020.
• To achieve the quantitative targets mentioned in previous tables, Iran economy should overcome to some structural challenges.
• Solutions and Policies will be set in 6th development plan of Iran to overcome these challenges.
• SDGs can be monitored using quantitative indices during the 2016-2020 period.
## Quantitative Targets for 2016-2020

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</thead>
<tbody>
<tr>
<td>Economic Growth</td>
<td>3</td>
<td>5.1</td>
<td>7</td>
<td>8.4</td>
<td>9.5</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td>10.6</td>
<td>11.5</td>
<td>11.2</td>
<td>10.3</td>
<td>9.2</td>
<td>8.3</td>
<td>10.1</td>
</tr>
<tr>
<td>Inflation</td>
<td>15.6</td>
<td>14.2</td>
<td>12.2</td>
<td>10.7</td>
<td>9.7</td>
<td>8.1</td>
<td>11</td>
</tr>
<tr>
<td>Gini Coefficient</td>
<td>0.365*</td>
<td>Gini coefficient is reaching 0.34 in final year of development plan</td>
<td></td>
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<tr>
<td>Energy Intensity</td>
<td>0.147**</td>
<td>Energy intensity is proposed to reduce to ½ of current value until 2020.</td>
<td></td>
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<tr>
<td>CO₂ Emission</td>
<td></td>
<td>CO₂ Emission is planned to have a 4% reduction unconditionally, and 12% conditional to international cooperation, until 2030.</td>
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*Gini coefficient for 2013  
** Final energy intensity (at ppp) (kCO₂/$05p)
## Quantitative Targets for 2016-2020

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<tbody>
<tr>
<td>Ratio of Tax to Current Expenditure</td>
<td>47.9</td>
<td>53</td>
<td>60</td>
<td>69</td>
<td>79</td>
<td>89</td>
<td>70</td>
</tr>
<tr>
<td>Ratio of Tax to GDP</td>
<td>6.4</td>
<td>6.4</td>
<td>6.7</td>
<td>7</td>
<td>7.3</td>
<td>7.4</td>
<td>6.9</td>
</tr>
<tr>
<td>ICOR</td>
<td>6</td>
<td>5.7</td>
<td>4.7</td>
<td>4.4</td>
<td>4.6</td>
<td>3.7</td>
<td>4.6</td>
</tr>
<tr>
<td>Ratio of Investment to GDP</td>
<td>24.7</td>
<td>25.3</td>
<td>28.9</td>
<td>34.8</td>
<td>33.8</td>
<td>32.9</td>
<td>30.6</td>
</tr>
<tr>
<td>Openness</td>
<td>33</td>
<td>38</td>
<td>40</td>
<td>43</td>
<td>47</td>
<td>49</td>
<td>43.6</td>
</tr>
</tbody>
</table>
Linkage Between SDGs

1. NO POVERTY
2. ZERO HUNGER
3. GOOD HEALTH AND WELL-BEING
4. QUALITY EDUCATION
5. GENDER EQUALITY
6. CLEAN WATER AND SANITATION
7. AFFORDABLE AND CLEAN ENERGY
8. DECENT WORK AND ECONOMIC GROWTH
9. INDUSTRY, INNOVATION AND INFRASTRUCTURE
10. REDUCED INEQUALITIES
11. SUSTAINABLE CITIES AND COMMUNITIES
12. RESPONSIBLE CONSUMPTION AND PRODUCTION
13. CLIMATE ACTION
14. LIFE BELOW WATER
15. LIFE ON LAND
16. PEACE, JUSTICE AND STRONG INSTITUTIONS
17. PARTNERSHIPS FOR THE GOALS
## Monitoring Indicators for SDGs

<table>
<thead>
<tr>
<th>Goals</th>
<th>Indicators</th>
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<tbody>
<tr>
<td>1 End poverty in all its forms everywhere</td>
<td>• Poverty gap ratio (MDG Indicator)</td>
</tr>
<tr>
<td></td>
<td>• Percentage of population using banking services (including mobile banking)</td>
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<td>• Indicator on equal access to inheritance</td>
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<td></td>
<td>• Disaster Risk Reduction Indicator</td>
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<tr>
<td>8 Promote inclusive and sustainable economic growth, employment and decent work for all</td>
<td>• Growth rate of GDP per person employed</td>
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<td>• Working poverty rate measured at $2 PPP per capita per day</td>
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<td></td>
<td>• Indicator of decent work</td>
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<td>• Household income, including in-kind services</td>
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<td>• Employment to population ratio (EPR) by gender and age group (15–64)</td>
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<td></td>
<td>• Share of informal employment in total employment</td>
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<td></td>
<td>• Percentage of own-account and contributing family workers in total employment</td>
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<td></td>
<td>• Percentage of young people not in education, employment or training (NEET)</td>
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<td></td>
<td>• Indicator on implementation of 10-year framework of programs on sustainable consumption and production</td>
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<tr>
<td>10 Reduce inequality within and among countries</td>
<td>• Gini Coefficient</td>
</tr>
<tr>
<td></td>
<td>• Income/wage persistence (intergenerational socioeconomic mobility)</td>
</tr>
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<td></td>
<td>• Human Mobility Governance Index</td>
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<td></td>
<td>• Net ODA to LDCs as percentage of high-income countries’ GNI (modified from MDG Indicator)</td>
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<tr>
<td></td>
<td>• Indicator on share of LDCs / LIC representatives on boards of IMF / WB (and other institutions of governance)</td>
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<tr>
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<td>• Remittance transfer costs</td>
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</tbody>
</table>
How ESCAP Can Help

Technical training to design quantitative models
Design quantitative models for simulation and policy analysis
Design regional models such as regional input-output model and social accounting matrix and GVAR

Goals Nationalization
Targeting based on conditions of each country
Appoint custodian institution in each country to achieve each goal
Monitoring the Performance
Consulting assistance
THANKS FOR YOUR ATTENTION