

Inforum Software for Building Dynamic, Interindustry Macroeconomic Models

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What is INFORUM?

INFORUM abbreviates Interindustry Forecasting at the University of Maryland but now describes a group of model builders from around the world who work together to build interindustry macroeconomic models for their countries.

The Group is open to new partners who wish to work seriously on interindustry models of their own countries. There is no charge for membership or the use of the software.

How is the Software Presently Used?

This software currently powers a dozen or so Interindustry Macroeconomic models of countries and a bilateral world trade model that connects these models at the industry level.

It is also underlies the world model described by Bernd Meyer at this conference.

It is used for macroeconomic models of single countries and for a macro model of 75 countries and their trade connections.

It is being used in the development of interconnected regional models with some thirty regions within a country.

What Kinds of Models does the Software Build?

The software is extremely flexible and can be used to build any model involving identities, regression equations, and matrix calculations. It can be used to model dynamic evolution of firms, industries, and environmental systems as well as economies.

It presumes that evolution of the system modeled over time is of central importance.

The software allows optimization by the model user of an objective function specified in the model. This optimization feature can be used in two ways:

1. To vary regression coefficients to improve the performance of the model in historical simulation.
2. To design policy, such as tax rates or money supply, to optimize a specified social welfare function.

It is **not** designed for models where the behavior of economic units – households, firms, governments – is determined by numerical optimization as the model runs.

How Is the Software Written?

- The software was written by people building models, not by programmers given an econometrics text written by someone who had never built a model.
- Originally written in Fortran in the 1960's, it was converted to C, then to C++, and was adapted to Windows with Borland Builder.

What are the Input-Output Models Like?

- The models are **macroeconomic** in that they cover the variables of concern in macroeconomics: total employment and unemployment, income, price level, interest rates, GDP, and so on.
- They are **interindustry** because they show detail for a number of industries connected through an input-output table.
- The models involve a **combination** of regression-based econometrics with input-output calculations.

Starting a Model of China

Let us illustrate the software by starting a model of China. We will go only as far as we can with the software available on the Internet. That means we will stop with an input-output model driven by a macromodel. To integrate the two requires the use of the Interdyme extension of the software, which is available to cooperating partners.

Before getting into input-output, it is well to begin with the macroeconomic part of the model, which will be needed to connect value-added by industry with personal income of households and make up government accounts.

Like many countries, China uses the System of National Accounts (SNA) adopted by the UN and other international organizations. It is far more complicated and less operational than the U.S. system, but must be thoroughly understood by anyone modeling an economy where it is used.

The SNA is shown in a sequence of five accounts, as follows:

SNA National Accounts of China 2000

# Transaction	Non-financial		Financial		Governments		Households		Rest of World		
code # Units: 100 million yuan.	Enterprises		Institutions								
name ? 元	Use	Source	Use	Source	Use	Source	Use	Source	Use	Source	
# Account 1: Production											
nex 1. Net Exports	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2240.30	0.00
vad 2. Value Added	0.00	50662.93	0.00	2133.19	0.00	8605.38	0.00	28066.60	0.00	0.00	0.00
col 3. Compensation of Laborers	18126.53	0.00	778.46	0.00	8180.98	0.00	26195.40	53241.88	16.69	56.18	56.18
wag (1) Wages and Related Income	15804.28	0.00	609.12	0.00	8180.98	0.00	26195.40	50750.29	16.69	56.18	56.18
ecs (2) Employer's Contribution for Social Security	2322.25	0.00	169.34	0.00	0.00	0.00	0.00	2491.59	0.00	0.00	0.00
tpn 4. Taxes on Production, Net	12196.00	0.00	957.59	0.00	173.60	14701.68	1374.49	0.00	0.00	0.00	0.00
inp 5. Income from Properties	6334.50	2034.61	5358.54	5645.50	454.47	239.23	39.89	3128.07	992.18	2132.13	2132.13
int (1) Interest	4527.50	1999.98	5320.08	5613.80	454.47	239.23	39.89	2978.98	973.68	483.63	483.63
div (2) Dividend	1807.00	18.48	0.00	31.70	0.00	0.00	0.00	126.78	18.50	1648.50	1648.50
rnt (3) Rent on Land Use	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
opi (4) Others	0.00	16.15	38.46	0.00	0.00	0.00	0.00	22.31	0.00	0.00	0.00
A. Total Primary = Lines 1+2+3+4 +5	36657.03	52697.54	7094.59	7778.69	8809.05	23546.29	27609.78	84436.55	3249.17	2188.31	2188.31
B. Source - Use in line A by Institution		16040.51		684.10		14737.24		56826.77		-1060.86	
# Account 2: Taxes and transfers											
pri 6. Total Income from Primary Distribution	0.00	16040.51	0.00	684.10	0.00	14737.24	0.00	56826.77	0.00	0.00	0.00

# Transaction	Non-financial		Financial		Governments		Households		Rest of World	
# Units: 100 million yuan.	Enterprises		Institutions							
? 元	Use	Source	Use	Source	Use	Source	Use	Source	Use	Source
# Account 2: Taxes and transfers										0.00
6. Total Income from Primary Distribu	0.00	16040.51	0.00	684.10	0.00	14737.24	0.00	56826.77	0.00	0.00
7. Current Transfer	2842.21	169.99	508.86	352.00	2583.46	5199.08	3382.92	4118.86	567.97	45.49
(1) Taxes on Income	1866.82	0.00	156.86	0.00	0.00	2695.28	671.60	0.00	0.00	0.00
(2) Payment to Social Security	0.00	0.00	0.00	0.00	2347.09	2491.59	2491.59	2347.09	0.00	0.00
(3) Allowances	80.00	0.00	0.00	0.00	228.60	0.00	0.00	308.60	0.00	0.00
(4) Others	895.39	169.99	352.00	352.00	7.77	12.21	219.73	1463.17	567.97	45.49
C. Lines 6 +7	2842.21	16210.50	508.86	1036.10	2583.46	19936.32	3382.92	60945.63	567.97	45.49
D. Sources - Uses in line C, by institution		13368.29		527.24		17352.86		57562.71		-522.48
# Account 3: Disposable Income and consumption										
8. Total Disposable Income	0.00	13368.29	0.00	527.24	0.00	17352.86	0.00	57562.71	0.00	0.00
9. Final Consumption Expenditure	0.00	0.00	0.00	0.00	11705.26	0.00	42911.40	0.00	0.00	0.00
(1) Household Consumption	0.00	0.00	0.00	0.00	0.00	0.00	42911.40	0.00	0.00	0.00
(2) Government Consumption	0.00	0.00	0.00	0.00	11705.26	0.00	0.00	0.00	0.00	0.00
E. Lines 8 + 9	0.00	13368.29	0.00	527.24	11705.26	17352.86	42911.40	57562.71	0.00	0.00
F. Sources - Uses in line E, by institution		13368.29		527.24		5647.60		14651.31		0.00
# Account 4: Savings and investment										
10. Savings	0.00	13368.29	0.00	527.24	0.00	5647.60	0.00	14651.31	0.00	-1639.52
11. Capital Transfer	0.00	4557.42	0.00	1.00	4558.42	0.00	3.89	0.00	0.00	3.89
12. Gross Capital Formation	24315.77	0.00	116.89	0.00	3163.82	0.00	4903.36	0.00	0.00	0.00
(1) Gross Fixed Capital Formation	24633.77	0.00	116.89	0.00	3163.82	0.00	4709.36	0.00	0.00	0.00
(2) Changes in Inventories	-318.00	0.00	0.00	0.00	0.00	0.00	194.00	0.00	0.00	0.00
13. Minus Items from Other Non-finan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
G. Lines 10+11+12	24315.77	17925.71	116.89	528.24	7722.24	5647.60	4907.25	14651.31	0.00	-1635.63
H. Sources - Uses in line G, by institution		-6390.06		411.35		-2074.64		9744.06		-1635.63

First we find the statistical discrepancy between
the sum of value added and GDP by the expenditure approach.
(Net exports appears here with a minus sign because in the
Chinese Institutional accounts Net imports are strangely called Net Exports.)

fex StatDisc = vades+vadbs+vadgs+vadhs - (hcehu+
gcegu+cffdu+cfidu-nexrs)

These exports and imports are from Customs and are not
equivalent to the (not released) exports and imports in the
national accounts.

fex exportsR = exports/gdpD

fex importsR = imports/gdpD

f exports = exportsR*gdpD

f imports = importsR*gdpD

ti Labor Compensation by Institution

Use proportions to value added

fex coleuBR = coleu/vades

f coleu = coleuBR*vades

fex colbuBR = colbu/vadbs

f colbu = colbuBR*vadbs

fex colguBR = colgu/vadgs

f colgu = colguBR*vadgs

fex colhuBR = colhu/vadhs

f colhu = colhuBR*vadhs

Leave Rest of World items exogenous and

give the balance to households

f colhs = coleu+colbu+colgu+colhu+colru - colrs

#subti To Households as Source

#gr colhs a.colhs

ti Taxes on production

fex tpneuBR = tpneu/vades

f tpneu = tpneuBR*vades

fex tpbuBR = tpbu/vadbs

f tpbu = tpbuBR*vadbs

fex tpnguBR = tpngu/vadgs

f tpngu = tpnguBR*vadgs

fex tpbuBR = tpbu/vadhs

f tpbu = tpbuBR*vadhs

#subti Balance to Government as Source

f tpngs = tpneu+tpbu+tpngu+tpbu

#gr tpngs a.tpngs

#subti