

# Economic Forecasting

Simulation  
versus  
Forecasting Models

# A Keynesian Macroeconomic Simulation Model

National Income and Demand  $Y = C + I + G + (X - M)$

Consumption  $C = a_0 + a_1(Y - T)$

Investment  $I = I_0 - d * r$

Tax revenue  $T = t_0 + t_1 * Y$

Import  $M = m_0 + m_1 * Y$

Solution  $Y = (a_0 - a_1 * t_0 + I + G + X - m_0) / (1 - a_1 + a_1 * t_1 + m_1)$

Endogenous variables: Y, C, T, I, M; Exogenous variables: G, X, r

Parameters  $a_0, a_1, t_0, t_1, m_0, m_1, I_0, d$

# Steps for Solving a Simulation Model

- Reduce the model in one variable (income) in terms of exogenous variable and parameters substituting out all other endogenous variables
- Fix the plausible values of parameters and the exogenous variables and compute the value of income
- Then find the values of all other variables
- Check whether the model solutions fulfil the macro-consistency conditions
- Do counter-factual policy or behavioural scenarios

## Benchmark Model and Design of Policy Simulations

	Base Case	Tax cut	Spending	MPC	T &G	High X	High I	MMM
Government Spending	200	200	400	200	400	200	200	200
Exports	100	100	100	100	100	300	100	100
Interest rate	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Autonomous Consumption	300	300	300	300	300	300	300	300
Marginal Propensity to Consume	0.8	0.8	0.8	0.9	0.8	0.8	0.8	0.8
Autonomous investment	50	50	50	50	50	50	200	50
Slope of investment function	10	10	10	10	10	10	10	10
Autonomous tax	30	30	30	30	30	30	30	30
tax rate	0.3	0.2	0.2	0.3	0.2	0.3	0.3	0.3
Autonomous imports	20	20	20	20	20	20	20	20
Marginal Propensity to import	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.4

# Solutions of the Basic Keynesian Model

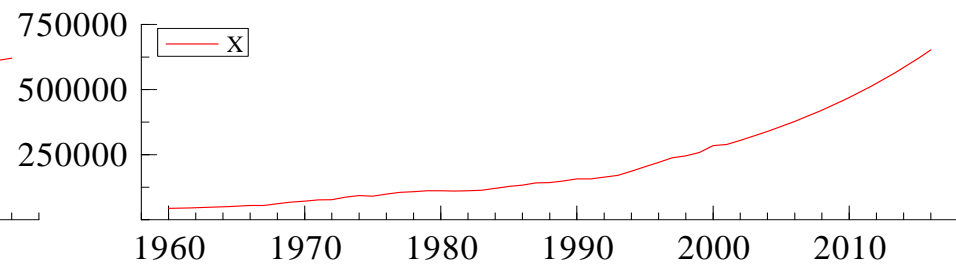
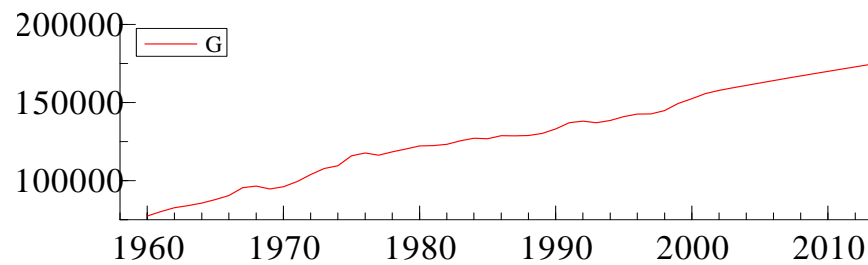
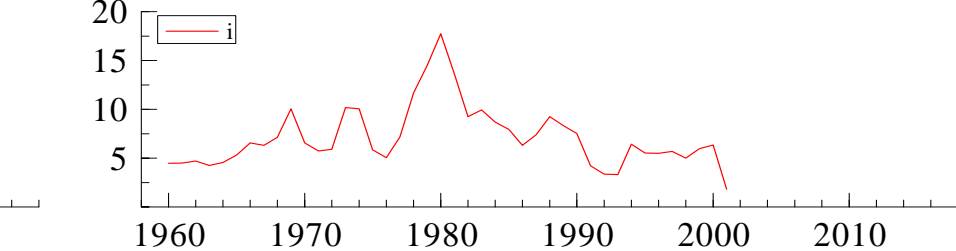
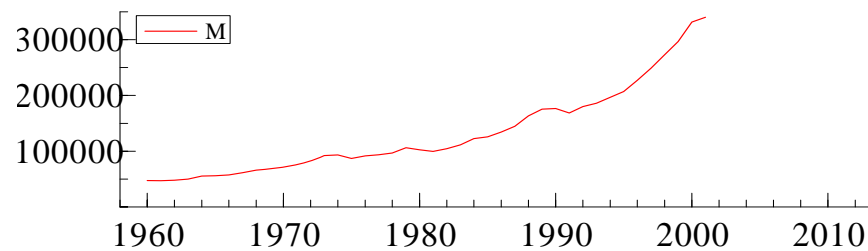
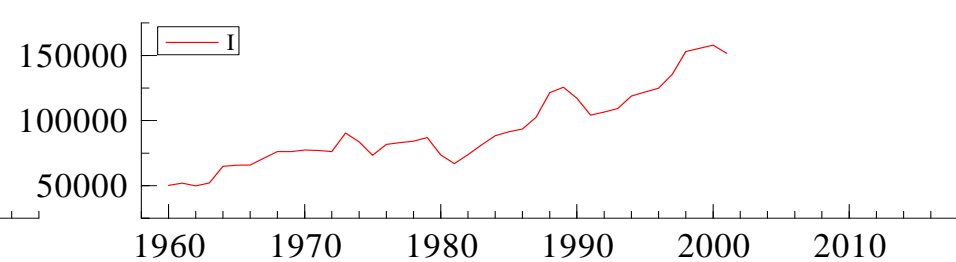
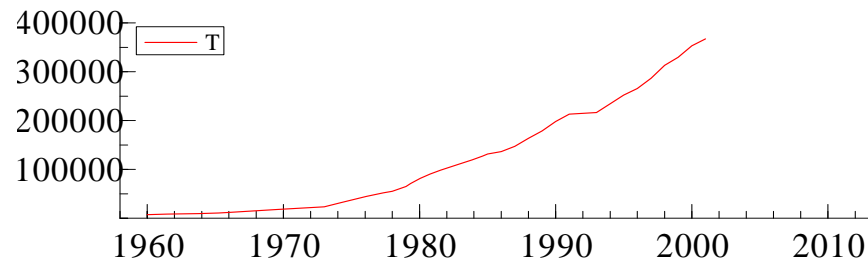
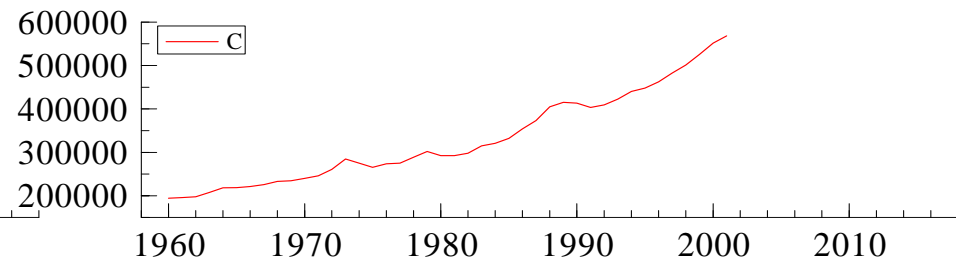
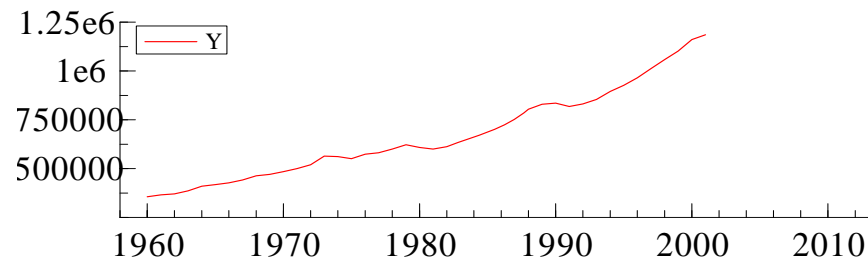
	Y	T	C	I	G	X	M	S	T-G	X-M	S-I	Bal
Base case	877	293	767	49	200	100	239	-183	93	-139	-232	-139
Tax cut												
Spending												
MPC												
T&G												
High X												
High I												
MMM												

# Solutions of the Basic Keynesian Model

Y	T	C	I	G	X	M	S	T-G	X-M	S-I	Bal	
Base case	877	293	767	49	200	100	239	-183	93	-139	-232	-139
Tax cut	992	228	911	49	200	100	268	-147	28	-168	-196	-168
Spending	1167	380	929	49	400	100	312	-143	-20	-212	-192	-212
MPC	971	321	885	49	200	100	263	-235	121	-163	-284	-163
T&G	1320	294	1121	49	400	100	350	-95	-106	-250	-144	-250
High X	1167	380	929	49	200	300	312	-143	180	-12	-192	-12
High I	1094	358	889	199	200	100	294	-153	158	-194	-352	-194
MMM	720	246	679	49	200	100	308	-205	46	-208	-254	-208

1. Tax cut is expansionary
2. Increase in public spending is expansionary
2. Increase in consumer confidence (MPC) in expansionary
3. Equal increase in taxes and sending is expansionary
4. Higher export is expansionary
5. Higher investment is expansionary
5. Increase in propensity to imports (MMM) is concretionary

# Time Series on Macroeconomic Variables: GiveWin Graphics



## Estimation of the Reduced form of the Model from PcGive

$$C = + 1.136 * G + 1.18 * X - 1847 * i + 6.101e+004$$

$$(SE) \quad (0.35) \quad (0.114) \quad (920) \quad (2.6e+004)$$

$$I = + 0.007214 * G + 0.4136 * X - 119.8 * i + 4.112e+004$$

$$(SE) \quad (0.198) \quad (0.0644) \quad (519) \quad (1.47e+004)$$

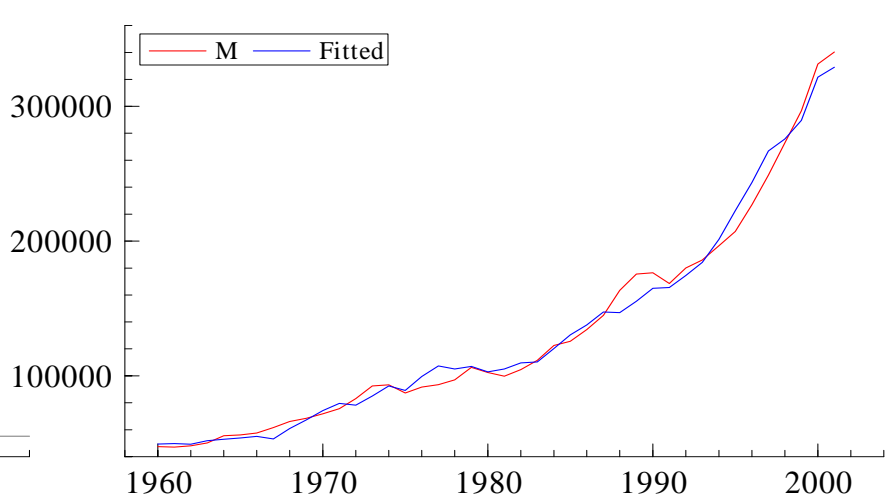
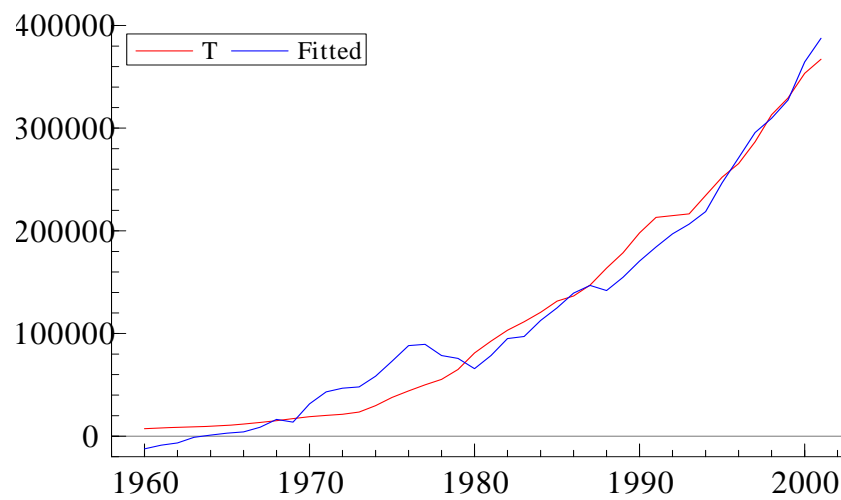
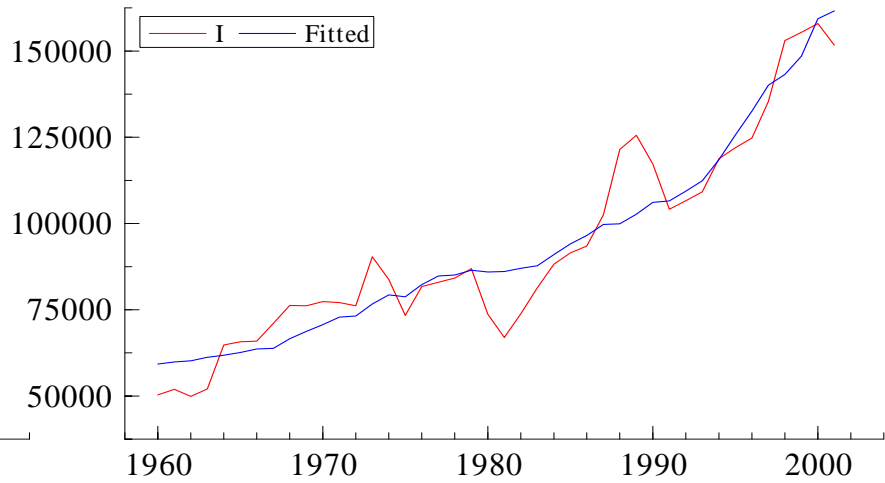
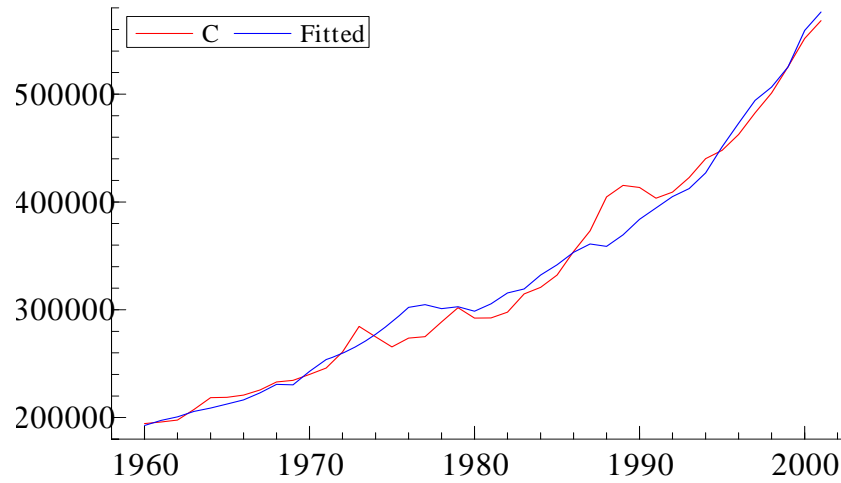
$$T = + 0.653 * G + 1.385 * X - 3371 * i - 1.087e+005$$

$$(SE) \quad (0.422) \quad (0.138) \quad (1.11e+003) \quad (3.14e+004)$$

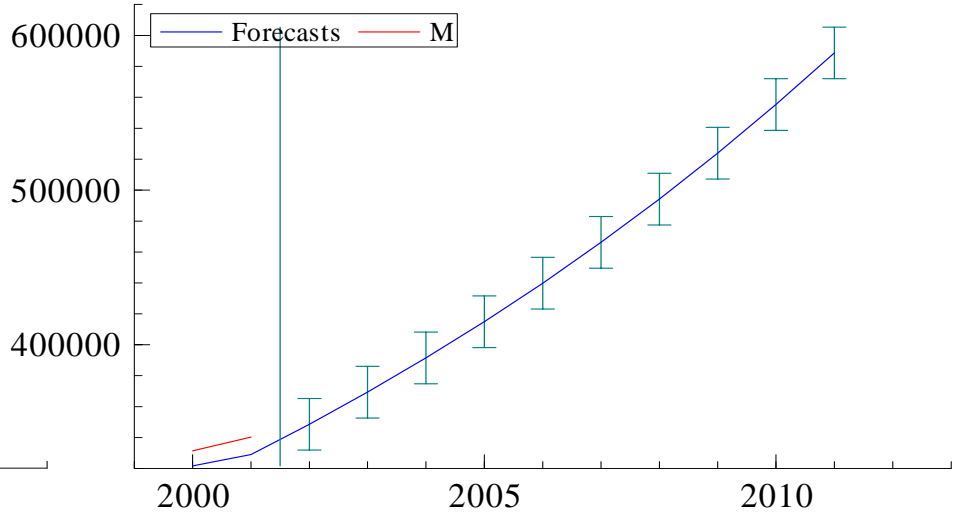
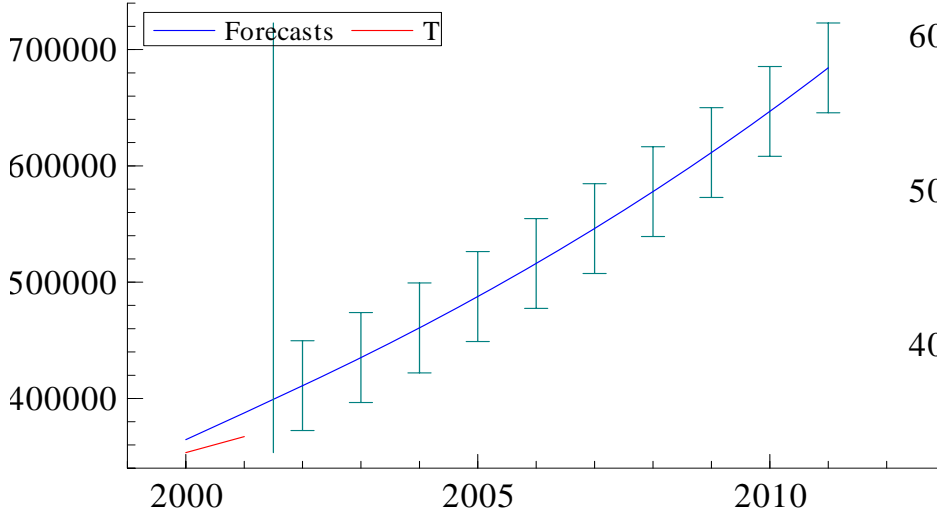
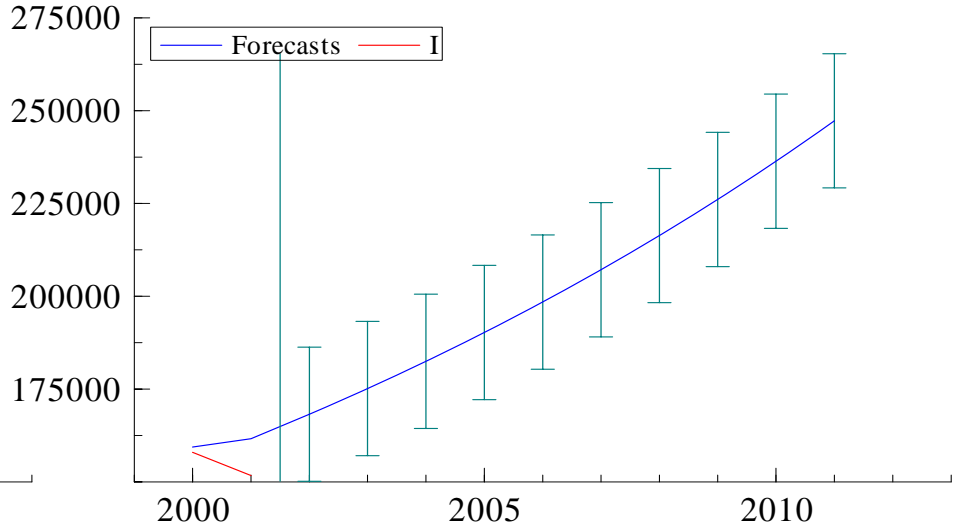
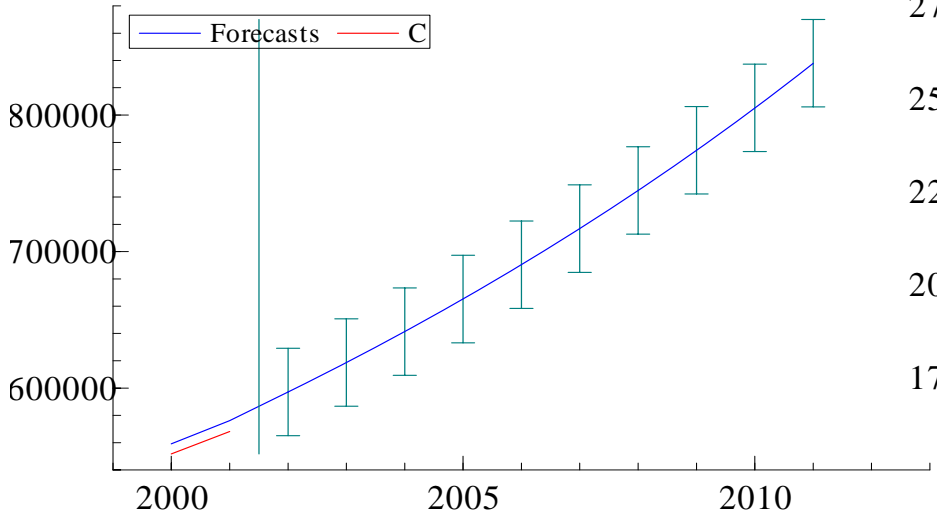
$$M = - 0.5083 * G + 1.294 * X - 828.4 * i + 3.568e+004$$

$$(SE) \quad (0.183) \quad (0.0595) \quad (480) \quad (1.36e+004)$$

# Actual and Predicted Values of Macroeconomic Variables: Ex-Post Forecast



# Ex-Ante Macroeconomic Forecast Using a Macroeconometric Model



# Steps for Macroeconomic Forecasting Model

- Prepare macroeconomic time series data in Excel.
- Determine endogenous and exogenous variables and expected values of parameters from the estimation.
- Estimate the model using multi-equation simultaneous equation modelling routine in PcGive.
- Analyse Estimated results.
- Use graphics to plot actual and predicted series.
- Forecast values of exogenous variables using some autoregressive process.
- Add those forecasts in the data file.
- Select the periods for forecast horizon.
- Forecast values of endogenous variables and represent them using graphs with confidence intervals of forecasts.
- Find numerical values of forecasts and their standard errors.

### Three Sector Input/Output Table for 1999/00 at Producer's Price (In Million Rs.)

	agricultu re	manufac turing	services	Private consum ption	Govern ment consum ption	Private Fixed invest ment	Govern ment fixed invest ment	Stock	Export s	Total
Agricult ure	8694	19112	229	103889	0	538	0	44489	1943	178894
Manufa cturing	6626	23760	4394	87367	0	37810	25493	-25026	44264	204687
Service s	16459	32781	39919	53345	34579	1270	384	8782	42713	230233
Interme diate input	2147	37525	41014	36282	0	4179	468	0	0	121616
Wages	46203	25922	60383	0	0	0	0	0	0	132508
Depreci ation	1722	3702	10094	0	0	0	0	0	0	15517
Indirect tax	244	14101	1344	7063	0	814	91	0	1241	24898
Capital	96799	47785	72856	0	0	0	0	0	0	217439
Total	178894	204687	230233	287947	34579	44611	26436	28245	90161	

Source: Derived from the 25 sector IO Table of Nepal received from the NPC Secretariat in Kathmandu, courtesy P. Shakya.

## Technology Coefficient and Shares in Consumption, Production and Final Demand

	agr	man	serv	Pcon	Gcon	Prfxinv	Gfxinv	Stock	Exp
agr	0.049	0.093	0.001	0.361	0.000	0.012	0.000	1.575	0.022
man	0.037	0.116	0.019	0.303	0.000	0.848	0.964	-0.886	0.491
serv	0.092	0.160	0.173	0.185	1.000	0.028	0.015	0.311	0.474
intimp	0.012	0.183	0.178	0.126	0.000	0.094	0.018	0.000	0.000
Wages	0.258	0.127	0.262	0.000	0.000	0.000	0.000	0.000	0.000
Depr	0.010	0.018	0.044	0.000	0.000	0.000	0.000	0.000	0.000
Indtx	0.001	0.069	0.006	0.025	0.000	0.018	0.003	0.000	0.014
capital	0.541	0.233	0.316	0.000	0.000	0.000	0.000	0.000	0.000
Total	1.000	1.000	1.000	1.000	1.000	1.000	1.00	1.00	1.00