KYOTO PROTOCOL EFFECT on ECONOMIC SECTORS in IRAN (VAR Model Review)

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The Kyoto Protocol: Challenges and Opportunities Development of I.R.Iran

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KEY POINT

According to this study we would like find some key point, if Kyoto Protocol implemented in Iran,

✓What will be happened in Iran Macroeconomics factors?

✓The primary conclusion shows us that oil income decrease has negative effect but what is the suitable remedy?

✓We believe if Iran accepts Kyoto Protocol should be replaced and compensate income losses from decreasing Oil income by non oil commodity and Natural Gas Export.

Short Term Dynamisms and Vector Auto regression (VAR)

Usually experts considered simultaneous, or structural, equation models. In such models some variables are treated as endogenous and some as exogenous or predetermined (exogenous plus lagged endogenous).

Before we estimate such models, we have to make sure that the equations in the system are identified (either exactly or over).

This identification is often achieved by assuming that some of t he predetermined variables are present only in some equations.

This identification is often achieved by assuming that some of t he predetermined variables are present only in some equations. This decision is often subjective and has been severely criticized by Christopher Sims.

According to ***Sims***, if there is true simultaneity among a set of variables, they should all be treated on an equal footing; there should not be any a priori distinction between Endogenous and exogenous variables. It is in this spirit that Sims developed his VAR mode l.

Vector Autoregressions (VAR and VEC)

The structural approach to simultaneous equations modeling uses economic theory to describe the relationships between several variables of interest. The resulting model is then estimated, and used to test the empirical relevance of the theory.
Unfortunately, economic theory is often not rich enough to provide a tight specification of the dynamic relationship among variables. Furthermore, estimation and inference are complicated by the fact that endogenous variables may appear on both the left and right sides of the equations.

These problems lead to alternative, non-structural, approaches to modeling the relationship between several variables. Here we describe the estimation and analysis of vector autoregression (VAR) and the vector error correction (VEC) models. We also describe tools for testing for the presence of cointegrating relationships among several variables.

VAR Theory

The vector autoregression (VAR) is commonly used for forecasting systems of interrelated time series and for analyzing the dynamic impact of random disturbances on the system of variables.

The VAR approach sidesteps the need for structural modeling by modeling every endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system.

The mathematical form of a VAR is

$$y_t = A_1 y_{t-1} + \cdots + A_p y_{t-p} + B x_t + \epsilon_t$$

where y_t is a *k* vector of endogenous variables, x_t is a *d* vector of exogenous variables, A_1 ,...,A_p and B are matrices of coefficients to be estimated, and e_t is a vector of innovations that may be contemporaneously correlated with each other but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables.

Since only lagged values of the endogenous variables appear on the right-hand side of each equation, there is no issue of simultaneity, and OLS is the appropriate estimation technique. Note that the assumption that the disturbances are not serially correlated is not restrictive because any serial correlation could be absorbed by adding more lagged y's.

VAR Theory

As an example of a VAR, suppose that industrial production (IP) and money supply (M1) are jointly determined by a two variable VAR and let a constant be the only exogenous variable. With two lagged values of the endogenous variables, the VAR is

$$IP_t = a_{11}IP_{t-1} + a_{12}M1_{t-1} + b_{11}IP_{t-2} + b_{12}M1_{t-2} + c_1 + \epsilon_{1,t}$$
$$M1_t = a_{21}IP_{t-1} + a_{22}M1_{t-1} + b_{21}IP_{t-2} + b_{22}M1_{t-2} + c_2 + \epsilon_{2,t}$$

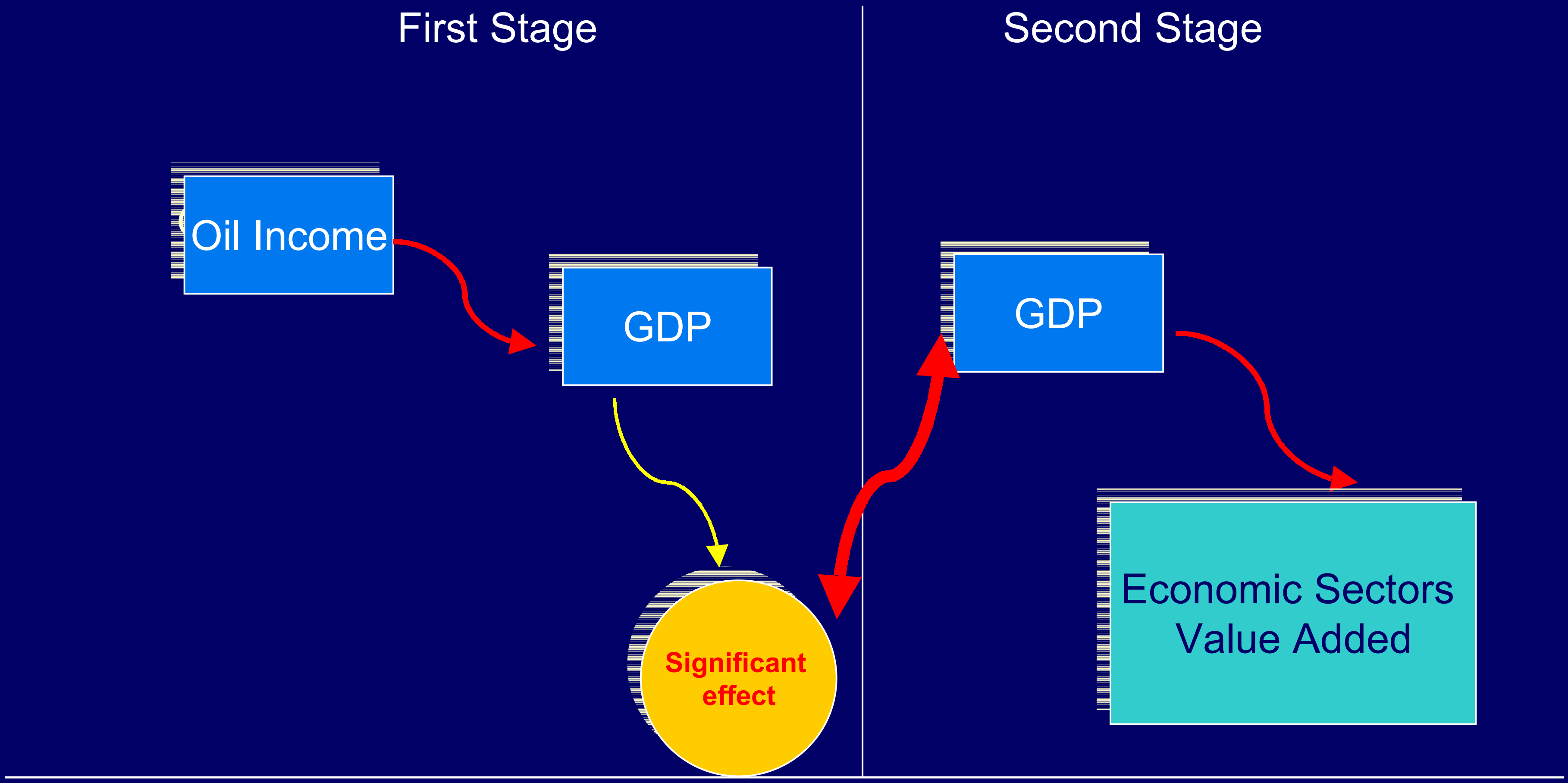
where a, b, c are the parameters to be estimated.

Data and Time series Variables

Base Year= 1376

Gross Domestic Product	gdp
Oil and Gas	og
Total Agriculture	ag
Total Mining	m
Total oil	o
Total Manu. Industries	in
Total Electricity, Oil, Water	egw
Total Construction	tc
Total Trade	tr
Total Transportation	ttrans
Total Road Transportation	troad
Total communication	ttscommu
Total Banking	t mf
Total Residential Bld.	trb
Total Building Services	trnrb
Public Services	pubs
Total Services	tsspds
Employment	Employ

VAR Model Algorithm



Var. Model: Impulse Effect (LNGDP-LNOG)

Regarding to estimation of impulse response function (IRF) and study of one S.D shock on **Logarithm of Oil income** in first year **LNOG** will be 0.2212 increased this is around 1.25 billion Rials this Shock in second year increase **LNOG** around 0.2338.
This is interesting that effect of shock will be effects for 10 years.
Effects of **LNOG** shock increase **LNGDP** around 0.0303 that is around 1 billion Rials.

Variance Decomposition of LNOG:			
Period	S.E.	LNOG	LNGDP
1	0.221249	100.0000	0.000000
2	0.323391	99.11812	0.881676
3	0.379855	98.50401	1.495986
4	0.408105	98.18095	1.819047
5	0.420838	98.04009	1.959910
6	0.425949	97.99385	2.006150
7	0.427726	97.98660	2.013405
8	0.428227	97.98908	2.010921
9	0.428326	97.98942	2.010579
10	0.428342	97.98487	2.015131

Variance Decomposition of LNGDP:			
Period	S.E.	LNOG	LNGDP
1	0.058343	59.53548	40.46452
2	0.101565	65.60912	34.39088
3	0.135385	67.42962	32.57038
4	0.160988	67.91776	32.08224
5	0.180308	67.89069	32.10931
6	0.195068	67.65924	32.34076
7	0.206572	67.35936	32.64064
8	0.215740	67.05303	32.94697
9	0.223207	66.76750	33.23250
10	0.229404	66.51303	33.48697
Ordering: LNOG LNGDP			

Var. Model: Impulse Effect (LNGDP-LNAG-LNEGW-LNM)

The **GDP** shock effects on economics sector value added and employment as in bellow:

Firstly you can see effects of **LNGDP** on **LNAG**, **LNEGW** and **LNM**.

If GDP logarithm shock effect has been more than 0 the value added increase more than 1 billion Rials and if changes less than 0 values added decrease less than 1 billion Rials.

Response of LNGDP:				
Period	LNGDP	LNAG	LNEGW	LNM
1	0.048878	0.000000	0.000000	0.000000
	(0.00546)	(0.00000)	(0.00000)	(0.00000)
2	0.050788	-0.008306	-0.014494	0.020722
	(0.01062)	(0.00832)	(0.00807)	(0.00752)
3	0.058161	-0.016378	-0.029477	0.022926
	(0.01433)	(0.01089)	(0.01160)	(0.01132)
4	0.059817	-0.018956	-0.035396	0.026205
	(0.01740)	(0.01330)	(0.01479)	(0.01474)
5	0.058788	-0.019613	-0.041194	0.026949
	(0.01963)	(0.01498)	(0.01812)	(0.01721)
6	0.055447	-0.019327	-0.043288	0.026315
	(0.02124)	(0.01623)	(0.02099)	(0.01835)
7	0.050869	-0.017542	-0.043671	0.025474
	(0.02229)	(0.01702)	(0.02336)	(0.01866)
8	0.056515	-0.016126	-0.042429	0.023979
	(0.02291)	(0.01747)	(0.02506)	(0.01823)
9	0.049836	-0.012196	-0.039977	0.022410
	(0.02315)	(0.01763)	(0.02607)	(0.01735)
10	0.044176	-0.009048	-0.036775	0.020716
	(0.02304)	(0.01756)	(0.02639)	(0.01620)

Var. Model: Summary of Impulse Effect on other variable

Regarding to **GDP** impulse we can classified variable in bellow table, this table show us that more sensitivity on productive section.

Summary of LNGDP impulse on Value added:

Non Sensitive (Less than 1 Billion Rials)	Sensitive (More than 1 Billion Rials)
LNAG	LNO
LNEGW	LNTMF
LNM	LNTRB
LNPUBS	LNTTRANS
LNTR	LNTROAD
LNTTSCOMU	LNTRNRB
LNTSSPDS	

At last we will review the impulse of **LNGDP** on **LNEMPLOYMENT** the result show us that one shock on LNGP create 1000 employee .

Conclusion:

Iran must be tried as soon as possible joint to Kyoto protocol but gradually and regarding to crude oil income losses must be substituted and think about new income sources.

✓**First of all there are possible that some part of mention losses compensate by Natural Gas export and regarding to potential of Iran for entering to International gas trade Iran has two options for exerting LNG and pipe line.**

✓**Second energy optimization and decrease energy intensity**

✓**And last expand non-oil trade.**