Bijan Bidabad

Macro Econometric Model of Iran

Monetary, Public, Foreign, Real, Nominal and Labor Markets with Systemic Price Determination Macro Model
(Version: 6.1)

LAP LAMBERT Academic Publishing

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Version: 6.1

(Technical Document)

Bijan Bidabad

Partially Revised Edition

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Preface to Version 6.1

Macro econometric model building is of the last parts of econometric science. When I started to make a macro model for Iran in 31 years ago in 1983, there was not even sufficient macro data series for Iran's economy. But as I continued to build macro models from a prototype one to a small size (17 and more equations)[1] models and then to a modest size (140 equations) and then a large size Macro Econometric Model of Iran (200 equations) the data series were produced and improved. Model building in a less developed country is not an easy task. When the economy is not well behaved and structured and data are less accurate and accessible, and in-sample economic and political history of country is full of volatilities and structural breaks, macro econometric model building becomes completely a complex task. This is why few macro econometric models were built for each less developed economy. For example many endeavors have been made to build macro models for Iran, but the problem of macro-modelling is not just putting equations beside together. The closure of the model and the links between the variable throughout the model and its simultaneity is the hardest part of simultaneous system of equations model building. When model solution and simulation starts all deficiencies of the model appears. More or less all the built models for Iran suffer from this shortage, and this is why the models die after some short times. I should assess that macro model building is neither a task of a student project nor a university teacher. A macro model builder must be a multidisciplinary experienced

[1] Bidabad, Bijan, (2003). *Small macro econometric model of Iran*. Tehran: Monetary and Banking Research Academy, Central Bank of Iran.
http://www.bidabad.ir/doc/Small-macro-econometric-model.pdf

economist both in theoretical and public-policy-execution fields with cumulative knowledge about all aspects of country in past and present and economic, mathematical, statistical and computation related sciences. Structural versus time series models are based on different approaches of Cambridge and Chicago schools to formulation of economic phenomena. The former is based on logical foundations of economic theory and is best for policy analysis, though the latter focuses on empiricism and predicts the future better if economic structure remains unchanged.

The version 6.1 of the Macro Econometric Model of Iran which is a structural model is still at the end of all structural models of Iran and has been using for many policy analyses for domestic economy and international scene policy simulations as LINK project of the United Nations. Macro Econometric Model of Iran is a fully analyzed built structural model and can be used as a base for development of macro or sectoral structural econometric model for Iran and also as a base to be used for adaptation in other countries.

Many domestic and international institutes and organizations requested for more documents about Macro Econometric Model of Iran frequently. LAP LAMBERT Academic Publishing (OmniScriptum GmbH & Co. KG) also became interested to publish the book and I agreed. In this regard I tried to prepare the version 6.1 of the model with some minor elaborations on version 6.0 with more detailed explanations.

I dedicate my sincere gratitude to all my colleagues in different stages of this work and I appreciate their cooperation

Bijan Bidabad[2]

Winter 2014

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Preface to Version 6

Macro econometric models locate at the frontier of applied quantitative economic analyses and are comprised of sophisticated scientific, technical and arts of model building accompanying with sufficient knowledge about the history and mechanisms of the economy. In a developed economy, data are more accurate and accessible, economy is well behaved and structured and the process of model building is easier than a developing country with a volatile in-sample economic and political history. This comparison actually shows that macro econometric model building for a less developed country is completely more complex than for a developed country.

When I started to build prototype macro econometric models for Iran in 1983, many problems encountered which might discourage model builder to forget macro econometric model building for Iran. Monetary and Banking Research Academy (MBRA) decided to build a macro econometric model for Iran in 1995. I nominated to conduct this project and I organized my research team to do this task. The 3 preliminary versions of the macro econometric models of Iran were developed at that time and finally the 4th version was published in 1997. This version was actually the base frame for further extensions and developments. After some lags, the process continued again in 2002. The 5th version of the macro econometric model of Iran finalized and published in 2004. The 6th version is presented at this book with continuous manipulation and updates over the previous versions. We hope to prepare the Link's version of the model to satisfy the United Nations Link Project requirements.

I should dedicate my sincere gratitude to my colleagues in different stages of this work, specially to Mr. F. Arbabi, Miss F. Bidabad, Dr. A. Arshadi, Mr. Y. Kazemi, Miss. S. Akbarpour, Miss M. Lorestani , Mr. Ghavidel and Miss A. Ahmadian for their cooperation. Dr. M.J. Mojarrad, foreign exchange deputy of central bank of Iran and Mr. H. Golriz and Dr. A.R. Boroujerdi the former presidents and Dr. A. Mojtahed the present president of MBRA supported this continuing project and I appreciate their administrative protects. Mrs. F. Tabari cooperated me in translating the documents to English and Mr. K. Sepehri and Mrs. F. Pourfard edited the whole book. I should be indebted to all of my colleagues.

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Spring 2006

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Chapter One

Structure of the Model

1-1 Introduction

The macro econometric model of Iran is one of the most generalized and extensive models of Iran. This model has 200 equations, 65 of which are stochastic and 135 equations are identities. The number of endogenous variables is equal to the number of equations and is equal to 200 variables. This model has 20 exogenous policy variables, 4 auxiliary exogenous variables and 38 qualitative explanatory variables in equations and identities, which along with one variable in the form of unit vector as a whole, would become 62 exogenous variables. Number of lagged variables is 108 variables which along with exogenous variables would be 180 predetermined variables. So, the whole variables of the model would be 370. In the case of adding the "add factors" to the model, the number of variables would be (370-570). The number of variables would be varied in different analytical cases, such as shock analysis, ex-post dynamic solution and forecasting. We deliberately, due to special cases and arguments use "add factor" less or more. This model has 208 parameters, which would be estimated with the use of Ordinary Least Squares (OLS) method by applying time series data for the period of years 1959-2003. Endogenous variables are the variables on the left side of the equations, which can be clearly found by looking at each equation.

1-2 General Features of Macro Econometric Model of Iran

Name: Macro econometric Model of Iran
Version: 6.10
Date: January 2007
Time Structure: Annual medium term model
Purpose: Policy analysis and forecasting
Estimation: Ordinary Least Squares (OLS)
Sample period: 1959-2003
Software: EViews (Econometric Views), Version 4.1
Simulation: Gauss-Seidel dynamic solution
Sectors: Foreign, monetary, government, real, nominal, price-exchange rate-wage, labor
Dynamism: One year lag, time accumulation, first order integrity removal
Mathematical Structure: Linear in parameters and nonlinear and linear in variables
Total number of behavioral equations: 200
Number of stochastic equations: 65
Number of identities: 135
Number of endogenous variables: 200
Number of exogenous policy variables: 20
Number of exogenous slack variables: 4
Total number of exogenous variables: 68
Number of lagged endogenous variables: 108
Total number of predetermined variables: 170
Total number of variables: 370
Number of coefficients: 208

1-3 Exogenous Policy Variables

1	IRKAD	Capital account in balance of payments, million Dollars
2	OECDP	Consumer price index of industrial countries
3	IRCIFP	Import CIF price index
5	IRWPOIL	Weighted price of Iran's oil in international markets, Dollars
6	IRYOILB	Production of oil, million barrels per year
7	IREO	Official exchange rate, Rials/Dollar
8	IREX	Export exchange rate, Rials/Dollar
9	LIBOR	London interbank offer rate, percent
10	IRFEOAV	Foreign exchange obligation account, billion Rials
11	IRGRDSV	Sell of Dollar at unofficial exchange market, billion Rials
12	IRGECV	Government current expenditures, billion Rials
13	IRGEDV	Government development expenditures, billion Rials
14	IRGESPV	Government special payments expenditures, billion Rials
15	IRGEFIV	Government foreign investment expenditures, billion Rials
16	IRPDOIL	Index of domestic price of oil products
17	IRIRS	Saving deposits weighted average interest rate (banking system)
18	IRIRL	Loans weighted average interest rate (banking system)
19	IROLPV	Government budget obligatory loans granted to private sector
20	IROLGV	Government budget obligatory loans granted to government sector

21 IRMACHIMV Ratio of import of machineries and equipment to total current import

1-4 Exogenous Slack Variables

IRWARCD:	War damages on construction
IRWARED:	War damages on equipment
IRWARMD:	War damages on materials
IRYEAR:	Iranian year

1-5 Dummy Variables Definitions

General features of dummy variables are as indicated by following expressions:

The symbols "a", "b", "c" and "d" are numeric digits.

59 ≥ ab ≥ 99, 00 ≥ cd ≥ 05

IRDab = {1: For the year[4] 19(or 20)ab ; 0: Otherwise}

IRDabcd = {1: For the period of 19(or 20)ab to 19(or 20)cd ; 0: Otherwise; cd=00 refers to the year 2000}

1-6 Endogenous Variables

1-6-1 Foreign Variables

1	IRTBD	Balance of trade, million Dollars
2	IRSBD	Balance of services, million Dollars
3	IRCAD	Current account, million Dollars
4	IRBOPD	Balance of payments, million Dollars
5	IRXGD	Export of goods, million Dollars
6	IRXNFSD	Export of nonfactor services, million Dollars

[4] All dates are in Gregorian calendar, to convert to Iranian year decrease Iranian year number by 621.

7	IRMNFSD	Import of nonfactor services, million Dollars
8	IRXGNOD	Export of nonoil goods, million Dollars
9	IRMGD	Import of goods, million Dollars
10	IRXSD	Export of services, million Dollars
11	IRMSD	Import of services, million Dollars
12	IRFYSBD	Balance of factor income services, million Dollars
13	IRNFSBD	Balance of nonfactor income services, million Dollars
14	IRBOPDC	Cumulative balance of payments, million Dollars
15	IRBOPEOD	Balance of payments errors and omissions, million Dollars
16	IRKADC	Cumulative capital account, million Dollars
17	IRCADC	Cumulative current account, million Dollars
18	IRTBDC	Cumulative balance of trade, million Dollars
19	IRSBDC	Cumulative balance of services, million Dollars
20	IRNTRD	Net transfers, million Dollars
21	IRFYSBDC	Cumulative balance of factor income services, million Dollars
22	IRNFSBDC	Cumulative balance of nonfactor income services, million Dollars
23	IRXOILD	Export of oil, million Dollars
101	IRXOILB	Export of oil, million barrels/year
102	IRXNFSDOP	Export of nonfactor services, million Dollars
103	IRMNFSDCIFP	Import of nonfactor services, million Dollars
104	IRMGDCIFP	Real import of goods, million Dollars
105	IRXGNODOP	Real export of nonoil goods, million Dollars
106	IRMFYSD	Import of factor income services, million

		Dollars
107	IRXFYSD	Export of factor income services, million Dollars
108	IRBOPEODC	Cumulative balance of payments errors and omissions, million Dollars
109	IRNTRDC	Cumulative net transfers, million Dollars

1-6-2 Monetary Variables

201	IRM2NGV	Net claim of banking system to government sector (including public government), billion Rials
202	IRM2NGGV	Net claim of banking system to public government, billion Rials
203	IRM2NGSV	Net claim of banking system to government sector (excluding public government) at constant prices, billion Rials
204	IRM2NPV	Net claim of banking system to private sector at constant prices, billion Rials
205	IROLVC	Cumulative obligatory loans in government budget, billion Rials
206	IROLV	Obligatory loans in government budget, billion Rials
207	IRDDV	Demand deposits of private sector, billion Rials
208	IRSDV	Saving and time deposits of private sector, billion Rials
209	IRCUV	Currency in hands of public, billion Rials
210	IRM2V	Liquidity, billion Rials
211	IRM2NFAV	Net foreign assets of banking system, billion Rials

212	IRM2NWV	Net worth and net of other items of banking system, billion Rials
301	IRM2NPVPGDPM	Net claim of banking system to private sector at constant prices, billion Rials
302	IRM2NGSVPGDPM	Net claim of banking system to government sector (excluding public government) at constant prices, billion Rials
303	IRM2NFAD	Net foreign assets of banking system, million Dollars
304	IRDDVPGDPM	Real demand deposits of private sector, billion Rials
305	IRSDVPGDPM	Real saving and time deposits of private sector, billion Rials
306	IRCUVPGDPM	Real currency in hands of public, billion Rials

1-6-3 Government Variables

401	IRGBDVC	Cumulative government budget deficit, billion Rials
402	IRGRV	Government revenue, billion Rials
403	IRGRTV	Government tax revenue, billion Rials
404	IRGEV	Government expenditure, billion Rials
405	IRGBDV	Government budget deficit, billion Rials
406	IRGESV	Government special expenditures, billion Rials
407	IRGEFIDC	Cumulative government expenditures in foreign investment, million Dollars
408	IRGRTIV	Government indirect tax revenue, billion Rials
409	IRGROILV	Government oil revenue, billion Rials
410	IRGRMV	Government miscellaneous revenue, billion Rials
411	IRGRSV	Government special revenue, billion Rials

412	IRGRTDV	Government direct tax revenue, billion Rials

1-6-4 Real Variables

601	IRAD	Aggregate demand at constant prices, billion Rials
602	IRAS	Aggregate supply at constant prices, billion Rials
603	IROUTPUT	Aggregate output at constant prices, billion Rials
604	IRGNS	Gross national saving at constant prices, billion Rials
605	IRNNS	Net national saving at constant prices, billion Rials
606	IRX	Export at constant prices, billion Rials
607	IRM	Import at constant prices, billion Rials
608	IRBOT	Balance of trade at constant prices, billion Rials
609	IRGDEM	Gross domestic expenditure at market price at constant prices, billion Rials
610	IRSP	Private saving at constant prices, billion Rials
611	IRTOT	Terms of trade, billion Rials
612	IRGDIM	Gross domestic income at market price at constant prices, billion Rials
613	IRDIS	Discrepancies at constant prices, billion Rials
614	IRGNPM	Gross national product at market price at constant prices, billion Rials
615	IRGNIM	Gross national income at market price at constant prices, billion Rials
616	IRNNIF	Net national income at factor cost at constant prices, billion Rials

617	IRNFY	Net factor income at constant prices, billion Rials
618	IRNIT	Indirect taxes at constant prices, billion Rials
619	IRK	Capital stock at constant prices, billion Rials
620	IRGDPM	Gross domestic product at market price at constant prices, billion Rials
621	IRYD	Disposable income at constant prices, billion Rials
622	IRI	Investment at constant prices, billion Rials
623	IRIT	Indirect taxes at constant prices, billion Rials
624	IRSUB	Subsidies at constant prices, billion Rials
625	IRGDPF	Gross domestic product at factor cost at constant prices, billion Rials
701	IRIG	Government investment at constant prices, billion Rials
702	IRG	Government consumption at constant prices, billion Rials
703	IRGDPNF	Nonoil gross domestic product at market price at constant prices, billion Rials
704	IRMG	Import of goods at constant prices, billion Rials
705	IRMNFS	Import of nonfactor services at constant prices, billion Rials
706	IRIP	Private investment at constant prices, billion Rials
707	IRVAOIL	Value added of oil at constant prices, billion Rials
708	IRCCA	Capital consumption allowances at constant prices, billion Rials
709	IRC	Private consumption at constant prices, billion

		Rials
710	IRXFY	Export of factor income from abroad at constant prices, billion Rials
711	IRMFY	Import of factor income from abroad at constant prices, billion Rials
712	IRXOIL	Oil export at constant prices, billion Rials
713	IRXNOILG	Export of goods at constant prices, billion Rials
714	IRXNFS	Export of nonfactor services at constant prices, billion Rials
715	IRINPUT	Input of production at constant prices, billion Rials
716	IRII	Change in inventory at constant prices, billion Rials

1-6-5 Nominal Variables

801	IRADV	Aggregate demand at current prices, billion Rials
802	IRASV	Aggregate supply at current prices, billion Rials
803	IROUTPUTV	Aggregate output at current prices, billion Rials
804	IRINPUTV	Aggregate input at current prices, billion Rials
805	IRGNSV	National saving at current prices, billion Rials
806	IRNNSV	Net national saving at current prices, billion Rials
807	IRXV	Export at current prices, billion Rials
808	IRMV	Import at current prices, billion Rials
809	IRBOTV	Balance of trade at current prices, billion Rials
810	IRGDEMV	Gross domestic expenditure at market price at

		current prices, billion Rials
811	IRSPV	Private saving at current prices, billion Rials
812	IRKV	Capital stock at current prices, billion Rials
813	IRGDIMV	Gross domestic income at market price at current prices, billion Rials
814	IRGNIMV	Gross national income at market price at current prices, billion Rials
815	IRNNIFV	Net national income at factor cost at current prices, billion Rials
816	IRGDPNFV	Nonoil gross domestic product at market price at current prices, billion Rials
817	IRGNPMV	Gross national product at market price at current prices, billion Rials
818	IRGDPMV	Gross domestic product at market price at current prices, billion Rials
819	IRYDV	Disposable income at current prices, billion Rials
820	IRCCAV	Capital consumption allowances at current prices, billion Rials
821	IRIV	Investment at current prices, billion Rials
822	IRDISV	Discrepancies at current prices, billion Rials
823	IRNITV	Net indirect taxes at current prices, billion Rials
824	IRNFYV	Net factor income at current prices, billion Rials
825	IRGDPFV	Gross domestic product at factor cost at current prices, billion Rials
901	IRGV	Government consumption at current prices, billion Rials
902	IRIGV	Government investment at current prices,

		billion Rials
903	IRSUBV	Subsidies at current prices, billion Rials
904	IRCV	Private consumption at current prices, billion Rials
905	IRVAOILV	Value added of oil sector at current prices, billion Rials
906	IRMGV	Import of goods at current prices, billion Rials
907	IRMNFSV	Import of nonfactor services at current prices, billion Rials
908	IRXFYV	Export of factor income from abroad at current prices, billion Rials
909	IRMFYV	Import of factor income from abroad at current prices, billion Rials
910	IRITV	Indirect taxes at current prices, billion Rials
911	IRIPV	Private investment at current prices, billion Rials
912	IRXOILV	Oil export at current prices, billion Rials
913	IRXNOILGV	Nonoil goods export at current prices, billion Rials
914	IRXNFSV	Nonfactor services export at current prices, billion Rials
915	IRIIV	Change in inventory at current prices, billion Rials

1-6-6 Price Variables

1001	IRPA	Implicit price deflator corresponding aggregate demand and supply
1002	IRPGDPF	Gross domestic product at factor cost, implicit price deflator
1003	IRPGNS	Gross national saving implicit price deflator

1004	IRPNNS	Net national saving implicit price deflator
1005	IRPMG	Import of goods implicit price deflator
1006	IRPMNFS	Import of nonfactor services implicit price deflator
1007	IRPXOIL	Export of oil implicit price deflator
1008	IRPXNOILG	Export of nonoil goods implicit price deflator
1009	IRPXNFS	Export of nonfactor services implicit price deflator
1010	IRPBOT	Balance of trade implicit price deflator
1011	IRPGDEM	Gross domestic expenditure at market price, implicit price deflator
1012	IRPSP	Private saving implicit price deflator
1013	IRPK	Capital stock implicit price deflator
1014	IRPGDPM	Gross domestic product implicit price deflator
1015	IRPC	Private consumption implicit price deflator
1016	IRPIG	Government investment implicit price deflator
1017	IRPIP	Private investment implicit price deflator
1018	IRPG	Government consumption implicit price deflator
1019	IRPNIT	Net indirect taxes implicit price deflator
1020	IRPM	Import implicit price deflator
1021	IRPX	Export implicit price deflator
1022	IRPNFY	Net factor income from abroad implicit price deflator
1023	IRPXFY	Export of factor income from abroad implicit price deflator
1024	IRPMFY	Import of factor income from abroad implicit price deflator
1025	IRPVAOIL	Oil value added implicit price deflator
1026	IRPI	Investment implicit price deflator

1027	IRINFCPI	Inflation rate, consumer price index
1028	IRINFWPI	Inflation rate, wholesale price index
1029	IRPGNPM	Gross national product implicit price deflator
1030	IRPDIS	Discrepancies implicit price deflator
1031	IRPGDIM	Gross domestic income implicit price deflator
1032	IRPGNIM	Gross national income implicit price deflator
1033	IRPYD	Disposable income implicit price deflator
1034	IRPNNIF	Net national income implicit price deflator
1035	IRPGDPNF	Nonoil gross domestic product implicit price deflator
1036	IRPIT	Indirect taxes implicit price deflator
1037	IRPSUB	Subsidies implicit price deflator
1038	IRPOUTPUT	Output implicit price deflator
1039	IRPII	Change in inventory implicit price deflator
2001	IREM	Market exchange rate, Rials/Dollar
2002	IREENOIL	Effective exchange rate for nonoil goods and services, Rials/Dollar
2003	IRWPIM	Wholesale price index for imported goods
2004	IRWPIX	Wholesale price index for exported goods
2005	IRWPID	Wholesale price index for domestically produced and consumed goods
2006	IRWPI	Wholesale price index
2007	IRCPI	Consumer price index
2008	IRIRNB	Non-organized market interest rate
2009	IRPCCA	Capital consumption allowances implicit price deflator
2010	IRPINPUT	Input implicit price deflator

1-6-7 Labor Market Variables

3001	IRWIND	Wage index

3002	IRPOPA	Active population, thousands
3003	IRUNEMP	Unemployment, thousands
3004	IRUNEMPR	Unemployment rate, percent
3101	IRPOPAPOP	Active population, ratio
3102	IRPOP	Population, thousands
3103	IRWINDPGDPM	Real wage index
3104	IREMP	Employment, thousands

1-7 Identities

As mentioned before this model has 135 explanatory identities. In explanation of some identities we use qualitative dummy variables which take the bivalent numbers one and zero. The reason is for eliminating mathematical ambiguities in some years or eliminating of dividing to zero for one variable in some special years or applying some necessary adjustments in some of unadjusted statistical figures. For example, we can mention to the identity 211 which is related to the net foreign asset of the banking system in terms of Rial and its conversion from dollar with applying the official exchange rate. Regarding the fact that during the years 1990 to 1993, the Central Bank applied some special adjustments for exchange rates, these adjustments have entered in the model by qualitative variables.

1-8 Equations

Number of regression equations in this model is 65. In the equations of the model, every unknown parameter would be shown by B(…) in which the first figures in the parentheses will show the connection of the parameter to the number of the equation. If the mentioned number ended to zero, it shows that parameter is an intercept e.g. B(1340) shows the intercept of the equation 134. The qualitative variables have been used for inserting different intercepts and slopes of equations in some other way. In some cases the equations are obliged to show special relations between parameters. e.g. in equation number 2002 the effective exchange rate has been showed in such a way that the sum of coefficients after the estimation will become one, so we can better reach to the concept of effective exchange rate. This would be the same for the wholesale price indices in equation 2006 in which the sum of parameters for estimation would be equal to one. This is because the index has been defined as the weighted average of three wholesale price indices for imported, exported and the domestically produced and consumed goods. In some other equations the intercepts have been eliminated because of their non-economic behavior in the ex-post simulation period. In some equations which we tried to use, the first order lagged equations, instead of applying differentiate operator (D), we brought the left hand variable with one period lag to the right hand side, which has the same meaning from mathematical point of view. This rearrangement is to establish stationary. Be careful that some regressions must have been defined as identities before, but we have intentionally introduced them as "bridge regressions".

1-9 System of Equations

The way of arranging stochastic equations and identities is such that in every section at first we brought identities and then regression equations. In these equations for simplicity, we ignored disturbances. It would be worth mentioning that every endogenous variable would be shown only one time in the left-hand side of the model.

The equations and identities in this model are distributed in different sections as follows:

No.	Sector	Identities	Equations	**Total**
1	Foreign	23	9	**32**
2	Monetary	12	6	**18**
3	Government	7	5	**12**
4	Real	25	16	**41**
5	Nominal	25	15	**40**
6	Price	39	10	**49**
7	Labor	4	4	**8**
8	**Total**	**135**	**65**	**200**

The parametric system of the model would be as below:

1-9-1 Foreign Sector

1: Balance of trade, million Dollars

IRTBD = IRXGD - IRMGD

2: Balance of services, million Dollars

IRSBD = IRXSD - IRMSD

3: Current account, million Dollars

IRCAD = IRTBD + IRSBD + IRNTRD

4: Balance of payments, million Dollars

IRBOPD = IRCAD + IRKAD + IRBOPEOD

5: Export of goods, million Dollars

IRXGD = IRXOILD + IRXGNOD

6: Export of nonfactor services, million Dollars

IRXNFSD = IRXNFSDOP * OECDP

7: Import of nonfactor services, million Dollars

IRMNFSD = IRMNFSDCIFP * IRCIFP

8: Export of nonoil goods, million Dollars

IRXGNOD = IRXGNODOP * OECDP

9: Import of goods, million Dollars

IRMGD = IRMGDCIFP * IRCIFP

10: Export of services, million Dollars

IRXSD = IRXNFSD + IRXFYSD

11: Import of services, million Dollars

IRMSD = IRMNFSD + IRMFYSD

12: Balance of factor income services, million Dollars

IRFYSBD = IRXFYSD - IRMFYSD

13: Balance of nonfactor income services, million Dollars

IRNFSBD = IRXNFSD - IRMNFSD

14: Cumulative balance of payments, million Dollars

IRBOPDC = IRBOPDC(-1) + IRBOPD

15: Balance of payments errors and omissions, million Dollars

IRBOPEOD = IRBOPEODC - IRBOPEODC(-1)

16: Cumulative capital account, million Dollars

IRKADC = IRKADC(-1) + IRKAD

17: Cumulative current account, million Dollars

IRCADC = IRCADC(-1) + IRCAD

18: Cumulative balance of trade, million Dollars

IRTBDC = IRTBDC(-1) + IRTBD

19: Cumulative balance of services, million Dollars

IRSBDC = IRSBDC(-1) + IRSBD

20: Net transfers, million Dollars

IRNTRD = IRNTRDC - IRNTRDC(-1)

21: Cumulative factor income services balance, million Dollars

IRFYSBDC = IRFYSBDC(-1) + IRFYSBD

22: Cumulative nonfactor income services balance, million Dollars

IRNFSBDC = IRNFSBDC(-1) + IRNFSBD

23: Export of oil, million Dollars

IRXOILD = IRWPOIL * IRXOILB

101: Export of oil, million barrels / year

IRXOILB = IRXOILB(-1) + B(1011) * (IRYOILB - IRYOILB(-1))

102: Export of nonfactor services, million Dollars

IRXNFSDOP = IRXNFSDOP(-1) + B(1021) * IREENOIL + B(1022) * (IRGDPNF - IRGDPNF(-1)) + B(1023) * IRD79

103: Import of nonfactor services, million Dollars

IRMNFSDCIFP = IRMNFSDCIFP(-1) + B(1030) + B(1031) * (IREENOIL * IRCIFP / IRWPI - IREENOIL(-1)*IRCIFP(-1) / IRWPI(-1)) + B(1032) * (IRGDPM - IRGDPM(-1)) + B(1033) * (IRD77 + IRD79 + IRD88 + IRD02)

104: Real import of goods, million Dollars

IRMGDCIFP = B(1040) + B(1041) * (IRXGD + IRXSD) + B(1042) * IREENOIL + B(1043) * IRGDPM + B(1044) * IRCIFP + B(1045) * IRKAD + B(1046) * IRD79

105: Real export of nonoil goods, million Dollars

IRXGNODOP = B(1050) + B(1051) * IREX * OECDP / IRWPI + B(1052) * IRXGNODOP(-1) + B(1053) * IRGDPNF

106: Import of factor income services, million Dollars

IRMFYSD = B(1060) + (B(1061) + B(1062) * (1 - IRD5977)) * IRKADC * LIBOR / 100 + B(1063) * IRMFYSD(-1) + B(1064) * IRD5978 * IRMGD + B(1065) * IRD5977 + B(1066) * IRD0208

107: Export of factor income services, million Dollars

IRXFYSD = B(1070) + B(1071) * IRGEFIDC + B(1072) * (1 - IRD5978) + B(1073) * IRXFYSD(-1) + B(1074) * IRD0108

108: Cumulative balance of payments errors and omissions, million Dollars

IRBOPEODC = B(1081) * IRKADC + B(1082) * IRTBDC + B(1083) * IRFYSBDC + B(1084) * IRNFSBDC + B(1085) * IRD84 + B(1086) * IRD9495

109: Cumulative net transfers, million Dollars

IRNTRDC = IRNTRDC(-1) + (B(1090) + B(1091) * IRKADC + B(1092) * IRTBDC + B(1093) * IRFYSBDC + B(1094) * IRNFSBDC + B(1095) * IRBOPEODC) * (1 + B(1096) * IRD5988) + B(1097) * IRD95 + B(1098) * IRD92

1-9-2 Monetary Sector

201: Net claim of banking system to government sector (including public government), billion Rials

IRM2NGV = IRM2NGGV + IRM2NGSV

202: Net claim of banking system to public government, billion Rials

IRM2NGGV = IRGBDVC + IRFEOAV + IROLVC

203: Net claim of banking system to government sector (excluding public government) at constant prices, billion Rials

IRM2NGSV = IRM2NGSVPGDPM * IRPGDPM

204: Net claim of banking system to private sector at constant prices, billion Rials

IRM2NPV = IRM2NPVPGDPM * IRPGDPM

205: Cumulative obligatory loans in government budget, billion Rials

IROLVC = IROLVC(-1) + IROLV

206: Obligatory loans in government budget, billion Rials

IROLV = IROLPV + IROLGV

207: Demand deposits of private sector, billion Rials

IRDDV = IRDDVPGDPM * IRPGDPM

208: Saving and time deposits of private sector, billion Rials

IRSDV = IRSDVPGDPM * IRPGDPM

209: Currency in hands of public, billion Rials

IRCUV = IRCUVPGDPM * IRPGDPM

210: Liquidity, billion Rials

IRM2V = IRCUV + IRDDV + IRSDV

211: Net foreign assets of banking system, billion Rials

IRM2NFAV = IRM2NFAD / (((1 - IRD93 - IRD90 - IRD91 - IRD92) / IREO + IRD93 / 1748 + IRD90 / 221.89 + IRD91 / 351.9 + IRD92 / 641.2) * 1000)

212: Net worth and other items net of banking system, billion Rials

IRM2NWV = IRM2V - (IRM2NPV + IRM2NGV + IRM2NFAV)

301: Net claim of banking system to private sector at constant prices, billion Rials

IRM2NPVPGDPM = IRM2NPVPGDPM(-1) + B(3011) * IRIRL + B(3012) * IRD7576

302: Net claim of banking system to government sector (excluding public government) at constant prices, billion Rials

IRM2NGSVPGDPM = B(3020) + B(3021) * IRM2NGSVPGDPM(-1) + B(3022) * IRIRL + B(3023) * IRD9497 + B(3024) * IRD5978 * IRM2NGSVPGDPM(-1)

303: Net foreign assets of banking system, million Dollars

IRM2NFAD = B(3031) * IRBOPDC + B(3032) * IRM2NFAD(-1) + B(3033) * IRD8589 + B(3034) * IRD9708

304: Real demand deposits of private sector, billion Rials

IRDDVPGDPM = B(3041) * IRGDPM + B(3042) * IRDDVPGDPM(-1) + B(3043) * IRIRS + B(3044) * IRIRNB

305: Real saving and time deposits of private sector, billion Rials

IRSDVPGDPM = B(3050) + B(3051) * IRGDPM + B(3052) * IRIRS + B(3053) * IRSDVPGDPM(-1)

306: Real currency in hands of public, billion Rials

IRCUVPGDPM = B(3060) + B(3061) * IRCUVPGDPM(-1) + B(3062) * IRGDPM + B(3063) * IRD5977 + B(3064) * IRIRL + B(3065) * IRIRNB + B(3066) * IRD79

1-9-3 Government Sector

401: Cumulative government budget deficit, billion Rials

IRGBDVC = IRGBDVC(-1) - IRGBDV

402: Government revenue, billion Rials

IRGRV = IRGROILV + IRGRTV + IRGRMV + IRGRDSV + IRGRSV

403: Government tax revenue, billion Rials

IRGRTV = IRGRTDV + IRGRTIV

404: Government expenditure, billion Rials

IRGEV = IRGECV + IRGEDV + IRGESV + IRGESPV + IRGEFIV

405: Government budget deficit, billion Rials

IRGBDV = IRGRV - IRGEV

406: Government special expenditures, billion Rials

IRGESV = IRGRSV

407: Cumulative government expenditures in foreign investment, million Dollars

IRGEFIDC = IRGEFIDC(-1) + IRGEFIV / IREO * 1000

501: Government indirect tax revenue, billion Rials

IRGRTIV = IRGRTIV(-1) + B(5011) * (IRMGV - IRMGV(-1)) + B(5012) * (IRCV - IRMGV - (IRCV(-1) - IRMGV(-1))) + B(5013) * IRD00 + B(5014) * IRD99

502: Government oil revenue, billion Rials

IRGROILV = B(5021) * (1 - IRD93) * IREO * (IRXOILD / 1000 - IRGRDSV / IREM) + B(5022) * IRPDOIL * (IRYOILB - IRXOILB) + B(5023) * IRD93 * (0.58 * 1000 + 0.42 * (IREO -1000)) * (IRXOILD / 1000 - IRGRDSV / IREM) + B(5024) * IRD0008 + B(5025) * IRD9597

503: Government miscellaneous revenue, billion Rials

IRGRMV = IRGRMV(-1) + B(5031) * (IROUTPUTV - IROUTPUTV(-1))

504: Government special revenue, billion Rials

IRGRSV = IRGRSV(-1) + B(5040) * (IROUTPUTV - IROUTPUTV(-1))

505: Government direct tax revenue, billion Rials

IRGRTDV = IRGRTDV(-1)+B(5051)*(IROUTPUTV - IROUTPUTV(-1))

1-9-4 Real Sector

601: Aggregate demand at constant prices, billion Rials

IRAD = IRINPUT + IRC + IRG + IRI + IRDIS + IRX + IRTOT

602: Aggregate supply at constant prices, billion Rials

IRAS = IROUTPUT + IRNIT + IRM + IRTOT

603: Aggregate output at constant prices, billion Rials

IROUTPUT = IRINPUT + IRGDPF

604: Gross national saving at constant prices, billion Rials

IRGNS = IRI + IRII + IRBOT + IRNFY + IRTOT

605: Net national saving at constant prices, billion Rials

IRNNS = IRGNS - IRCCA

606: Export at constant prices, billion Rials

IRX = IRXOIL + IRXNOILG + IRXNFS

607: Import at constant prices, billion Rials

IRM = IRMG + IRMNFS

608: Balance of trade at constant prices, billion Rials

IRBOT = IRX - IRM

609: Gross domestic expenditure at market price at constant prices, billion Rials

IRGDEM = IRC + IRG + IRI + IRBOT + IRDIS

610: Private saving at constant prices, billion Rials

IRSP = IRYD - IRC

611: Terms of trade, billion Rials

IRTOT = 2 * ((IRXV * IRM) - (IRMV * IRX)) / (IRXV + IRMV)

612: Gross domestic income at market price at constant prices, billion Rials

IRGDIM = IRGDPM + IRTOT

613: Discrepancies at constant prices, billion Rials

IRDIS = IRGDPM - (IRC + IRG + IRI + IRBOT)

614: Gross national product at market price at constant prices, billion Rials

IRGNPM = IRGDPM + IRNFY

615: Gross national income at market price at constant prices, billion Rials

IRGNIM = IRGNPM + IRTOT

616: Net national income at factor cost at constant prices, billion Rials

IRNNIF = IRGNIM - IRCCA - IRNIT

617: Net factor income at constant prices, billion Rials

IRNFY = IRXFY - IRMFY

618: Net indirect taxes at constant prices, billion Rials

IRNIT = IRIT - IRSUB

619: Capital stock at constant prices, billion Rials

IRK = IRK(-1) + IRI - IRCCA

620: Gross domestic product at market price at constant prices, billion Rials

IRGDPM = IRGDPNF + IRVAOIL + IRNIT

621: Disposable income at constant prices, billion Rials

IRYD = IRGDPNF + IRNFY - IRCCA - IRGRTDV / IRPIT

622: Investment at constant prices, billion Rials

IRI = IRIP + IRIG

623: Indirect taxes at constant prices, billion Rials

IRIT = IRITV / IRPIT

624: Subsidies at constant prices, billion Rials

IRSUB = IRSUBV / IRPSUB

625: Gross domestic product at factor cost at constant prices, billion Rials

IRGDPF = IRGDPNF + IRVAOIL

701: Government investment at constant prices, billion Rials

IRIG = IRIG(-1) + B(7011)*(IRGEDV/IRWPI - IRGEDV(-1) / IRWPI(-1)) + B(7012)*IRD76+B(7013)*IRD77+B(7014) * IRD78 + B(7015) * IRD79

702: Government consumption at constant prices, billion Rials

IRG = IRG(-1) + B(7021) * ((IRGECV + IRGESV)/IRWPI - (IRGECV(-1) + IRGESV(-1)) / IRWPI(-1))

703: Nonoil gross domestic product at market price at constant prices, billion Rials

IRGDPNF = B(7030) + B(7031) * IRK(-1) + B(7032) * (IRIP + IRIG - IRM * IRMACHIMV) + B(7033) * IREMP + B(7034) * IRM * IRMACHIMV + B(7035) * IRD79 + B(7036) * IRD8789

704: Import of goods at constant prices, billion Rials

IRMG = IRMG(-1) + B(7041) * (IRMGDCIFP - IRMGDCIFP(-1))

705: Import of nonfactor services at constant prices, billion Rials

IRMNFS = B(7051) * (IRMNFSDCIFP - IRMNFSDCIFP(-1)) + B(7052) * IRMNFS(-1)

706: Private investment at constant prices, billion Rials

IRIP = B(7060) + B(7061) * IRGDPNF(-1) + B(7062) * IRM * IRMACHIMV + B(7063) * IRIRL + B(7064) * IRD7779

707: Value added of oil at constant prices, billion Rials

IRVAOIL = B(7071)*IRVAOIL(-1)+B(7072)*(IRXOILB - IRXOILB(-1)) + B(7073) * ((IRYOILB - IRXOILB) - (IRYOILB(-1) - IRXOILB(-1))) + B(7074) * IRD02

708: Capital consumption allowances at constant prices, billion Rials

IRCCA = B(7080) + B(7081) * (1 + B(7082) * IRD9408) * IRK(-1) + B(7083)* (IRWARCD + IRWARED + IRWARMD) + B(7084) * IRD9408

709: Private consumption at constant prices, billion Rials

IRC = B(7091) * (IRYD - IRYD(-1)) + B(7092) * IRSP(-1) + IRC(-1)

710: Export of factor income from abroad at constant prices, billion Rials

IRXFY = IRXFY(-1) + B(7101) * (IRXFYSD / OECDP - IRXFYSD(-1) / OECDP(-1)) + B(7102) * IRD7879

711: Import of factor income from abroad at constant prices, billion Rials

IRMFY = IRMFY(-1) + B(7111) * (IRMFYSD / OECDP - IRMFYSD(-1) / OECDP(-1)) + B(7112) * IRD7377

712: Oil export at constant prices, billion Rials

IRXOIL = IRXOIL(-1) + B(7122) * (IRXOILB - IRXOILB(-1)) + B(7123) * IRD73 + B(7124) * IRD83

713: Export of goods at constant prices, billion Rials

IRXNOILG = IRXNOILG(-1) + B(7131) * (IRXGNODOP - IRXGNODOP(-1))

714: Export of nonfactor services at constant prices, billion Rials

IRXNFS = IRXNFS(-1) + B(7141) * (IRXNFSDOP - IRXNFSDOP(-1))

715: Input of production at constant prices, billion Rials

IRINPUT = IRINPUT(-1) + B(7151) * (IRGDPF - IRGDPF(-1)) + B(7152) * IRD79

716: Change in inventory at constant prices, billion Rials

IRII = B(7160) + B(7161) * (IRII(-1) / IROUTPUT(-1)) * (IROUTPUT - IROUTPUT(-1)) + B(7162) * IRII(-1) + B(7163) * IRYEAR + B(7164) * IRPGDPF + B(7165) * (IRD8285 + IRD9394 + IRD73)

1-9-5 Nominal Values

801: Aggregate demand at current prices, billion Rials

IRADV = IRINPUTV + IRCV + IRGV + IRIV + IRDISV + IRXV

802: Aggregate supply at current prices, billion Rials

IRASV = IROUTPUTV + IRNITV + IRMV

803: Aggregate output at current prices, billion Rials

IROUTPUTV = IRINPUTV + IRGDPFV

804: Aggregate input at current prices, billion Rials

IRINPUTV = IRPINPUT * IRINPUT

805: Gross national saving at current prices, billion Rials

IRGNSV = IRIV + IRIIV + IRBOTV + IRNFYV

806: Net national saving at current prices, billion Rials

IRNNSV = IRGNSV - IRCCAV

807: Export at current prices, billion Rials

IRXV = IRXOILV + IRXNOILGV + IRXNFSV

808: Import at current prices, billion Rials

IRMV = IRMGV + IRMNFSV

809: Balance of trade at current prices, billion Rials

IRBOTV = IRXV - IRMV

810: Gross domestic expenditure at market price at current prices, billion Rials

IRGDEMV = IRCV + IRGV + IRIV + IRBOTV + IRDISV

811: Private saving at current prices, billion Rials

IRSPV = IRYDV - IRCV

812: Capital stock at current prices, billion Rials

IRKV = IRKV(-1) * (1 + (IRPI - IRPI(-1)) / IRPI(-1)) + IRIV - IRCCAV

813: Gross domestic income at market price at current prices, billion Rials

IRGDIMV = IRGDPMV

814: Gross national income at market price at current prices, billion Rials

IRGNIMV = IRGNPMV

815: Net national income at factor cost at current prices, billion Rials

IRNNIFV = IRGNIMV - IRCCAV - IRNITV

816: Nonoil gross domestic product at market price at current prices, billion Rials

IRGDPNFV = IRPGDPNF * IRGDPNF

817: Gross national product at market price at current prices, billion Rials

IRGNPMV = IRGDPMV + IRNFYV

818: Gross domestic product at market price at current prices, billion Rials

IRGDPMV = IRGDPNFV + IRVAOILV + IRNITV

819: Disposable income at current prices, billion Rials

IRYDV = IRGDPNFV + IRNFYV - IRCCAV - IRGRTDV

820: Capital consumption allowances at current prices, billion Rials

IRCCAV = IRCCA * IRPCCA

821: Investment at current prices, billion Rials

IRIV = IRIGV + IRIPV

822: Discrepancies at current prices, billion Rials

IRDISV = IRGDPMV - (IRCV + IRGV + IRIV + IRBOTV)

823: Net indirect taxes at current prices, billion Rials

IRNITV = IRITV - IRSUBV

824: Net factor income at current prices, billion Rials

IRNFYV = IRXFYV - IRMFYV

825: Gross domestic product at factor cost at current prices, billion Rials

IRGDPFV = IRGDPNFV + IRVAOILV

901: Government consumption at current prices, billion Rials

IRGV = IRGV(-1) + B(9011) * ((IRGECV + IRGESV) - (IRGECV(-1) - (IRGESV(-1))))

902: Government investment at current prices, billion Rials

IRIGV = IRIGV(-1) + B(9021) * (IRGEDV - IRGEDV(-1)) + B(9022) * (IRFEOAV - IRFEOAV(-1)) + B(9023) * IROLGV + B(9024) * IRD9497 + B(9025) * IRD02

903: Subsidies at current prices, billion Rials

IRSUBV = IRSUBV(-1) + B(9031) * (IRGECV + IRGESV - IRGECV(-1) - IRGESV)

904: Private consumption at current prices, billion Rials

IRCV = IRCV(-1) + B(9041)*(IRYDV - IRYDV(-1))+B(9042)*IRSPV(-1)

905: Value added of oil sector at current prices, billion Rials

IRVAOILV = IRVAOILV(-1) + B(9051) * (IRXOILD / 1000 * IREO - IRXOILD(-1) / 1000 * IREO(-1)) + B(9052) * (IRPDOIL * (IRYOILB - IRXOILB) - IRPDOIL(-1) * (IRYOILB(-1) - IRXOILB(-1)))

906: Import of goods at current prices, billion Rials
IRMGV = IRMGV(-1) + B(9061) * (IRMGD * IREENOIL - IRMGD(-1) * IREENOIL(-1))

907: Import of nonfactor services at current prices, billion Rials
IRMNFSV = IRMNFSV(-1) + B(9071) * (IRMNFSD * IREENOIL - IRMNFSD(-1) * IREENOIL(-1))

908: Export of factor income from abroad at current prices, billion Rials
IRXFYV = IRXFYV(-1) + B(9081) * (IRXFYSD * IREENOIL - IRXFYSD(-1) * IREENOIL(-1))

909: Import of factor income from abroad at current prices, billion Rials
IRMFYV = IRMFYV(-1) + B(9090) + B(9091) * (IRMFYSD * IREENOIL - IRMFYSD(-1) * IREENOIL(-1)) + B(9092) * IRD93 + B(9093) * IRD5992

910: Indirect taxes at current prices, billion Rials
IRITV = IRITV(-1) + B(9101) * (IRGRTIV - IRGRTIV(-1))

911: Private investment at current prices, billion Rials
IRIPV = IRIPV(-1) + IROLPV + B(9111) * (IRIRL - IRIRL(-1)) + B(9112) * (IRIRNB - IRIRNB(-1)) + B(9113) * (IROUTPUTV - IROUTPUTV(-1)) + B(9114) * IRD99 + B(9115) * IRD02

912: Oil export at current prices, billion Rials

IRXOILV = IRXOILV(-1) + B(9121)*(IRXOILD * IREO - IRXOILD(-1) * IREO(-1)) + B(9122) * IRD9900

913: Nonoil goods export at current prices, billion Rials
IRXNOILGV = B(9131) * (IRXGNOD * IREENOIL - IRXGNOD(-1) * IREENOIL(-1)) + IRXNOILGV(-1)

914: Nonfactor services export at current prices, billion Rials
IRXNFSV = IRXNFSV(-1) + B(9141) * (IRXNFSD * IREENOIL - IRXNFSD(-1) * IREENOIL(-1))

915: Change in inventory at current prices, billion Rials
IRIIV = IRIIV(-1) + B(9151) * (IRIIV(-1) / IRINPUTV(-1)) * (IRINPUTV - IRINPUTV(-1)) + B(9152) * (IRIIV(-1) / IRGDPFV(-1)) * (IRGDPFV - IRGDPFV(-1)) + B(9153) * IRD00 + B(9154) * IRD95 + B(9156) * IRD03

1-9-6 Price

1001: Implicit price deflator corresponding aggregate demand and supply
IRPA = IRADV / IRAS

1002: Gross domestic product at factor cost implicit price deflator
IRPGDPF = IRGDPFV / IRGDPF

1003: Gross national saving implicit price deflator
IRPGNS = IRGNSV / IRGNS

1004: Net national saving implicit price deflator
IRPNNS = IRNNSV / IRNNS

1005: Import of goods implicit price deflator

IRPMG = IRMGV / IRMG

1006: Import of nonfactor services implicit price deflator

IRPMNFS = IRMNFSV / IRMNFS

1007: Export of oil implicit price deflator

IRPXOIL = IRXOILV / IRXOIL

1008: Export of nonoil goods implicit price deflator

IRPXNOILG = IRXNOILGV / IRXNOILG

1009: Export of nonfactor services implicit price deflator

IRPXNFS = IRXNFSV / IRXNFS

1010: Balance of trade implicit price deflator

IRPBOT = IRBOTV / IRBOT

1011: Gross domestic expenditure at market price implicit price deflator

IRPGDEM = IRGDEMV / IRGDEM

1012: Private saving implicit price deflator

IRPSP = IRSPV / IRSP

1013: Capital stock implicit price deflator

IRPK = IRKV / IRK

1014: Gross domestic product implicit price deflator

IRPGDPM = IRGDPMV / IRGDPM

1015: Private consumption implicit price deflator

IRPC = IRCV / IRC

1016: Government investment implicit price deflator

IRPIG = IRIGV / IRIG

1017: Private investment implicit price deflator

IRPIP = IRIPV / IRIP

1018: Government consumption implicit price deflator

IRPG = IRGV / IRG

1019: Net indirect taxes implicit price deflator

IRPNIT = IRNITV / IRNIT

1020: Import implicit price deflator

IRPM = IRMV / IRM

1021: Export implicit price deflator

IRPX = IRXV / IRX

1022: Net factor income from abroad implicit price deflator

IRPNFY = IRNFYV / IRNFY

1023: Export of factor income from abroad implicit price deflator

IRPXFY = IRXFYV / IRXFY

1024: Import of factor income from abroad implicit price deflator

IRPMFY = IRMFYV / IRMFY

1025: Oil value added implicit price deflator

IRPVAOIL = IRVAOILV / IRVAOIL

1026: Investment implicit price deflator

IRPI = IRIV / IRI

1027: Inflation rate, consumer price index

IRINFCPI = (IRCPI - IRCPI(-1)) / IRCPI(-1)

1028: Inflation rate, wholesale price index

IRINFWPI = (IRWPI - IRWPI(-1)) / IRWPI(-1)

1029: Gross national product implicit price deflator

IRPGNPM = IRGNPMV / IRGNPM

1030: Discrepancies implicit price deflator

IRPDIS = IRDISV / IRDIS

1031: Gross domestic income implicit price deflator

IRPGDIM = IRGDIMV / IRGDIM

1032: Gross national income implicit price deflator

IRPGNIM = IRGNIMV / IRGNIM

1033: Disposable income implicit price deflator

IRPYD = IRYDV / IRYD

1034: Net national income implicit price deflator

IRPNNIF = IRNNIFV / IRNNIF

1035: Nonoil gross domestic product implicit price deflator

IRPGDPNF = (IRCV + IRGV + IRIV + IRXV - IRMV + IRDISV - IRVAOILV - IRNITV) / IRGDPNF

1036: Indirect taxes implicit price deflator

IRPIT = IRPGDPF

1037: Subsidies implicit price deflator

IRPSUB = IRPGDPF

1038: Output implicit price deflator

IRPOUTPUT = IROUTPUTV / IROUTPUT

1039: Change in inventory implicit price deflator

IRPII = IRIIV / IRII

2001: Market exchange rate, Rials / Dollar

IREM = IREM(-1) + B(20011) * (IRM2V - IRM2V(-1)) + B(20012) * IRBOPD + B(20013) * IRGRDSV + B(20014) * IRD99 + B(20015) * IRD0208

2002: Effective exchange rate for nonoil goods and services, Rials / Dollar

IREENOIL = IREO * IRD5978 + (1 - IRD5978) * ((B(20020) + B(20021) * IREM + (1 - B(20021)) * IREO) + B(20022) * IREENOIL(-1) + B(20023) * IRD9308

2003: Wholesale price index for imported goods

IRWPIM = IRWPIM(-1) + B(20031)*(((IRMGD / (IRMGD + IRMNFSD)) * IRPM) - ((IRMGD(-1) / (IRMGD(-1) + IRMNFSD(-1))) * IRPM(-1)))

2004: Wholesale price index for exported goods

IRWPIX = IRWPIX(-1)+B(20041)*(((IRXGNOD/(IRXGD + IRXNFSD)) * IRPX) - ((IRXGNOD(-1) / (IRXGD(-1) + IRXNFSD(-1))) * IRPX(-1)))

2005: Wholesale price index for domestically produced and consumed goods

IRWPID = IRWPID(-1) + B(20051) * (IRPGDPNF - IRPGDPNF(-1))

2006: Wholesale price index

IRWPI = B(20061) * IRWPID + B(20062) * IRWPIM + (1 - B(20061) - B(20062)) * IRWPIX

2007: Consumer price index

IRCPI = IRCPI(-1) + B(20071) * (IRPGDPNF - IRPGDPNF(-1)) + B(20072) * IRD00

2008: Non - organized market interest rate

IRIRNB = B(20080) + B(20081) * IRIRNB(-1) + B(20082) * (IRSPV - IRSPV(-1)) + (IRCPI - IRCPI(-1)) / IRCPI(-1) + B(20083) * IRD7908 + B(20084) * IRD9699

2009: Capital consumption allowances implicit price deflator

IRPCCA = IRPCCA(-1) + B(20091) * (IRPK - IRPK(-1))

2010: Input implicit price deflator

IRPINPUT = IRPINPUT(-1) + B(20101) * (IRPGDPF - IRPGDPF(-1))

1-9-7 Labor Market

3001: Wage index

IRWIND = IRWINDPGDPM * IRPGDPM

3002: Active population, thousands

IRPOPA = IRPOPAPOP * IRPOP

3003: Unemployment, thousands

IRUNEMP = IRPOPA - IREMP

3004: Unemployment rate, percent

IRUNEMPR = IRUNEMP / IRPOPA * 100

3101: Active population ratio

IRPOPAPOP = B(31010) + B(31011) * IRPOPAPOP(-1) + B(31012) * IRYEAR + B(31012) * IRD66

3102: Population, thousands

IRPOP = B(31020) + B(31021) * IRPOP(-1)

3103: Real wage index

IRWINDPGDPM = IRWINDPGDPM(-1) + B(31031) * (IREMP - IREMP(-1)) + B(31032) * (IRGDPM - IRGDPM(-1)) + B(31033) * IRD7579 + B(31034) * IRD7880

3104: Employment, thousands

IREMP = IREMP(-1) + B(31041) * (IRWIND - IRWIND(-1)) + B(31042) * IRPOPA + B(31043) * IRD66 + B(31044) * IRD76

1-10 Block Structure of the Model

Block structure of a model would show the interdependence of the equations in the form of some separated computational blocks. The block structure implying that, the model can be separated to independent blocks, for which to solve each block we need not the variables of the equations of the other blocks.

By blocking the equations, we can better solve the models in the form of some smaller blocks and practically the variables which should be simultaneously solved would be less. By doing this we can better solve and study the model. We can use some separated structures, which show the interdependences among variables of different equations.

The blocks are categorized in two simultaneous and recursive sections. A recursive block is one that can be written in such a way that all its equations consist of only predetermined variables. A recursive block can simply be solved by solving the equations of the model. A simultaneous block is a block of equations which in any case, cannot be solved for one variable in a block without the feedback of other variables in other equations of the model. As a result the whole block should be solved simultaneously.

The block structure of Iran's macro econometric model is as follows:

Number of equations: 200
Number of independent blocks: 3
Number of simultaneous blocks: 1
Number of recursive blocks: 2

1-10-1 Block 1: 14 Recursive Equations

irxoilb(24)	irxoild(23)	irvaoilv(133)	irkadc(16)
irgefidc(57)	irxfysd(30)	irpop(198)	irpopapop(197)
irpopa(194)	irvaoil(94)	irxoilv(140)	irxoil(99)
irigv(130)	ircca(95)		

1-10-2 Block 2: 102 Simultaneous Equations

irtbd(1)	irsbd(2)	ircad(3)	irbopd(4)
irxgd(5)	irxnfsd(6)	irmnfsd(7)	irxgnod(8)
irmgd(9)	irxsd(10)	irmsd(11)	irfysbd(12)
irnfsbd(13)	irbopeod(15)	irtbdc(18)	irntrd(20)
irfysbdc(21)	irnfsbdc(22)	irxnfsdop(25)	irmnfsdcifp(26)
irmgdcifp(27)	irxgnodop(28)	irmfysd(29)	irbopeodc(31)
irntrdc(32)	irddv(39)	irsdv(40)	ircuv(41)
irm2v(42)	irddvpgdpm(48)	irsdvpgdpm(49)	ircuvpgdpm(50)
irgesv(56)	irgrtiv(58)	irgrsv(61)	irgrtdv(62)
irx(68)	irm(69)	irnit(80)	irk(81)
irgdpm(82)	iri(84)	irit(85)	irsub(86)
irgdpf(87)	irig(88)	irgdpnf(90)	irmg(91)
irmnfs(92)	irip(93)	irxnoilg(100)	irxnfs(101)
irinput(102)	iroutputv(106)	irinputv(107)	irxv(110)
irmv(111)	irbotv(112)	irspv(114)	irkv(115)
irgdpnfv(119)	irgdpmv(121)	irydv(122)	irccav(123)
iriv(124)	irdisv(125)	irnitv(126)	irnfyv(127)
irgdpfv(128)	irgv(129)	irsubv(131)	ircv(132)
irmgv(134)	irmnfsv(135)	irxfyv(136)	irmfyv(137)
iritv(138)	iripv(139)	irxnoilgv(141)	irxnfsv(142)
irpgdpf(145)	irpk(156)	irpgdpm(157)	irpm(163)
irpx(164)	irpi(169)	irpgdpnf(178)	irpit(179)
irpsub(180)	irem(183)	ireenoil(184)	irwpim(185)
irwpix(186)	irwpid(187)	irwpi(188)	ircpi(189)
irirnb(190)	irpcca(191)	irpinput(192)	irwind(193)
irwindpgdpm(199)	iremp(200)		

1-10-3 Block 3: 84 Recursive Equations

irbopdc(14)	ircadc(17)	irsbdc(19)	irm2ngsvpgdpm(46)
irm2ngsv(35)	irgev(54)	irgrmv(60)	irgroilv(59)
irgrtv(53)	irgrv(52)	irgbdv(55)	irgbdvc(51)
irolv(38)	irolvc(37)	irm2nggv(34)	irm2ngv(33)
irm2npvpgdpm(45)	irm2npv(36)	irm2nfad(47)	irm2nfav(43)
irm2nwv(44)	irmfy(98)	irxfy(97)	irnfy(79)
iryd(83)	irc(96)	irg(89)	irbot(70)
irdis(75)	irtot(73)	irad(63)	iroutput(65)
iras(64)	irii(103)	irgns(66)	irnns(67)
irgdem(71)	irsp(72)	irgdim(74)	irgnpm(76)
irgnim(77)	irnnif(78)	iradv(104)	irasv(105)
iriiv(143)	irgnsv(108)	irnnsv(109)	irgdemv(113)
irgdimv(116)	irgnpmv(120)	irgnimv(117)	irnnifv(118)
irpa(144)	irpgns(146)	irpnns(147)	irpmg(148)
irpmnfs(149)	irpxoil(150)	irpxnoilg(151)	irpxnfs(152)
irpbot(153)	irpgdem(154)	irpsp(155)	irpc(158)
irpig(159)	irpip(160)	irpg(161)	irpnit(162)
irpnfy(165)	irpxfy(166)	irpmfy(167)	irpvaoil(168)
irinfcpi(170)	irinfwpi(171)	irpgnpm(172)	irpdis(173)
irpgdim(174)	irpgnim(175)	irpyd(176)	irpnnif(177)
irpoutput(181)	irpii(182)	irunemp(195)	irunempr(196)

1-11 Special Characteristics

Principally, the obvious characteristic of a model would become clear from its variable, equations and their relations. We may describe the specific characteristics of this model as:

- All sectors are described in form of demand and supply and excess supply or demand is declared in necessary cases. E.g. in demand for imports and supply of exports, trade imbalance is shown as trade surplus or deficit. In foreign exchange receipts of export and payments of imports in balance of payments account defines a surplus or deficit in foreign money sector. In monetary section, the supply and demand for money, with net banking claim from the private sector, would be in equilibrium. In government sector, the government expenditure and revenue with budget deficit or surplus would create equilibrium situation. In the real sector, supply and demand of goods and services with changes in inventories accompanying with statistical discrepancies would reach to equilibrium. The same mechanism would exist in nominal sector from national income and national expenditure sides. In the labor market, the supply and demand of labor along with unemployment variable would cause equilibrium in the labor market. In other words, the deficit or surplus would cause equilibrium in the model markets and would change the disequilibrium structure of the model to equilibrium.
- Unlike the other econometrics models, the price in this model is determined systematically. In other models, there would be always one principal section, and the other price indices would be calculated by bridge regressions. In the present model, all implicit price deflators are calculated by dividing current quantities to fixed quantities and the theoretical mathematical relationships of implicit price deflators practically exist for different implicit price deflators of national income accounting figures. In other words, the weighted average of detailed implicit price deflators is equal to the whole implicit price deflators. This mechanism will provide very close relationship among the model variables, which makes the confidence bands of forecasts tighter.

- We also considered a new treatment to the balance of payments errors and omissions by their time accumulating and making them endogenous as function of other accumulated variables. By this manipulation, we would avoid the problem of guess estimates for the future ex-ante values of these variables, which would help a lot in accuracy of forecasting. Along this, we applied the zero summation and zero average statistical properties of errors for the long-run.
- Regarding different definitions of different figures in government budget and national accounts, and also differences between dollar figures of balance of payments and Rial figures of national accounts, we applied bridge regressions for protecting the existing definitions and also maintaining the relations among different accounts.
- The price in this model is completely endogenous, so calculating all of current and constant prices items are necessary. Thus, all figures from national accounting are both at constant and current prices.
- Duality of money markets is specified. The organized (banks) and non-organized (nonbanks) money markets based on supply and demand of deposits and credit facilities considering the weighted average of interest rates for both deposits and loan facilities and also the rate of interest at non-organized money market, are presented in the model.
- The other of duality in Iran's economy is government and government sector. Most of government companies and related institutions, committees, foundations and other similar institutions which are recorded under this category would be several times larger than government body itself as defined in public budget. This distinction between government and government sector would be obvious in comparing assets and liabilities accounts of the banking system, but we cannot easily obtain these figures in other sections of the economy. This government financial duality has been asserted in the model.

- Multiplicity of exchange rates is considered in the model. Official exchange rate, export exchange rate, effective and non-official or market exchange rates have all been shown and each rate has been applied for proper equation. The first two exchange rates are exogenous and the next two are endogenous.
- Foreign exchange obligation account of government which was increasing in last decade has been specified in the model.
- Considering the importance of oil sector in Iran's economy and dependence of Iran's economic variables to behavior of oil sector, the oil duality of Iran's economy as the oil and nonoil sectors has been fully specified.
- Providing necessary financial resources for private investment, net claims of banking system to private sector is connected to private nominal investment expenditures. This inter-relates money and investment sections of the model.
- The government obligatory loan facilities are considered in the model as private and public loans.
- For eliminating non-stationaries from some of time series and making them stationary we applied the simple first order lag or generalized first difference of the variables when necessary.
- Basic relation of foreign sector and monetary sector is based on monetary approach to balance of payments.
- The production function of nonoil goods and services is defined as perfectly substitutable.
- The related adjustments of exchange rate for banking system foreign assets have been considered in the model.

Chapter Two

Theoretical Mechanism and Functioning of the Model

2-1- Operative Mechanism and Sectors Linkages of the Model

One of the most important characteristics of all macro econometric models would be their sectors' linkages and interrelationships, which would make the economic viewpoint of the model builder clear. Here, we considered some basic sectors. The sectors' linkages were carefully based on the Iran's economy characteristics. Let's have a look at the provided framework. The basic sectors of the model are as follows:

- Foreign sector
- Monetary sector
- Government sector
- Real sector
- Nominal sector
- Price-exchange rate-wage
- Labor sector

In each of the above seven sections, we clearly specified the supply and demand dimensions in the model. In foreign sector, the demand for the import of goods and services and also the supply of the export of goods and services would ultimately show the disequilibrium in the foreign sector which would be asserted in the balance of payments. In the money sector, demand for money for components of banking system uses and supply of money from banking system resources; specify equilibrium in the money market. The government revenue and expenditure show the level of government activities, which finally by government budget deficit, we reach to government sector disequilibrium. In real sector of the economy, the product side as the supply side and the expenditure side as the demand side were used. In the nominal section of the model, the current production expenditures on one hand and the current expenditure of demand components on the other hand would make equilibrium on this sector. In the price part, the constant prices (real) and current prices (nominal) sections and their variables are used to define supply (production) and demand (expenditure) sides and prices are shown as their deflators. All the implicit price deflators have necessary relationships as in national income accounting. In the labor market, the supply and demand for labor were defined and the wage rate and unemployment are determined in relation with the performance of all sectors.

2-1-1 Foreign Sector

The oil price is considered as exogenous variable in the model. The oil revenue along with nonoil exports revenue are considered endogenous. The two oil and nonoil parts would determine the total export sector of the country. The demand for import function is adjusted by effective exchange rate and foreign prices. Also gross domestic product and the foreign exchange revenue resulted from the export of goods and services and the use of resources of capital account would determine the amount of imported goods. In this function, the capital account was considered exogenous for determining the effect of foreign borrowing on the demand for imports.

In general, the import demand function tries to determine the amount of imported goods with the help of effective exchange rate and the price of goods in foreign countries also by considering the total foreign exchange revenue resulted from the export of goods and services. The trade balance is determined from the difference between export and import which along with the net export of services and transfer payments would determine the current account balance of country. The export and import of services were categorized as receipts and payments of the factors and nonfactors of production from abroad which in total, few equations were applied to show for estimating their components.

Iran’s capital account and present foreign debt conditions and the way of calculating their grace period, forced us to change our treatment with these variables as exogenous. Trade balance, capital account and errors and omissions make the balance of payments account.

2-1-2 Monetary Sector

Money supply is defined as total banking system resources. In other words, the sum of net foreign assets, net claims to government sector (including government and quasi-government) and net claims to private sector and net capital account and other assets of the banking system. Net foreign assets of the banking system, connects monetary sector to balance of payments of foreign sector. This approach is based upon monetary approach to balance of payments. Net claims of banking system to government sector relate the monetary sector to the government sector equations of the model by government budget deficit financing. Net of other assets and capital account of the banking system are revalued and adjusted by inflation rate.

Net claim of the banking system to private sector is treated as liquidity residue. This residue would be the difference of the banking system uses (total of notes and coins in hands of public, current, savings and time deposits at the banking system), from three other resources of the banking system (net foreign assets of banking system, net claims of banking system to government sector, net of other assets and capital account of the banking system) in form of residue. This means that the banking system would provide credit to the private sector when it has free reserve.

When we cannot enter the interest rate as a variable in the demand for money function, we would face with several problems in our theoretical analysis and also in making a proper macroeconomic analysis. Some economists believe that in Iran's economy without interest rate as the conventional forms of western economies, we may apply "expected rate of inflation" instead of interest rate in an IS-LM framework of Hicks and Hanson. In general, applying a proxy variable in the model would cause some distortions in our theoretical analysis.

These distortions can be examined from three different points of views. At first, from quantitative point of view, the expected inflation rate and rate of interest are not equal. In theory, we can suppose that the rate of interest is less than or equal to the expected rate of inflation and their economic performances in both micro and macroeconomics are against each other; because interest rate is regarded as the nominal cost of investment but the expected rate of inflation will cause an increase in the nominal rate of return of investment. Any increase in interest rate will cause a decrease in investment but the expectation of price increase will cause increment in investment. In other words, the effect of interest rate and expected rate of inflation are in two opposite directions. The second important point is about the definition of IS curve. If we define IS curve as equilibrium in goods and services market, we can write it as follow:

y = c[y-t(y)] + g + i(r)

in which y is disposable income and c is consumption function and g is government expenditure and i stands for investment. Consumption is a function of disposable income and investment is a function of interest rate (r). The slope of IS curve would be derived simply from differentiating the two sides of the equation:

$$dy = c'.(dy - t'dy) + i'dr$$

$$\left.\frac{dr}{dy}\right|_{IS|r} = \frac{1-c'(1-t')}{i'(r)}$$

Since c' is the marginal propensity to consume and is positive and less than one and the income tax rate (t') is also less than one, the nominator of the above fraction is positive and the investment changes in relation to rate of interest (i') is negative. As a result:

$$1-c'(1-t')\rangle 0$$

$$i'(r) = \frac{\partial i(r)}{\partial r}\langle 0$$

$$\left.\frac{dr}{dy}\right|_{IS|r}\langle 0$$

Which means that IS curve is downward sloping. Now, if we put inflation instead of interest rate the IS equation would be:

y= c[y-t(y)] + g = i($\overset{\circ}{P^e}$)

In which ($\overset{\circ}{P^e}$) is expected rate of inflation. Slope of IS curve would be:

$$\left.\frac{dr}{dy}\right|_{IS|p^{\circ e}} = \frac{1-c'(1-t')}{i'(p^{\circ e})}\rangle 0$$

This is positive because:

$$i'(p^{\circ e}) = \frac{\partial i(p^{\circ e})}{\partial (p^{\circ e})} \rangle 0$$

In other words, IS curve is defined by a positive slope. In the case of replacing expected rate of inflation instead of current rate of interest, the discussion background will not change so much but another problem will appear that: while in determination of price level as intersection of aggregate demand and supply, the equilibrium price itself must be simultaneously determined in the IS curve as well.

The third point which can be deducted from the first point is the slope change of the LM curve. Though the changes in real money demand due to interest rate changes and also due to expected rate of inflation changes is negative, they are not equivalent, so replacing these two variables with each other will change the slope of LM curve.

Finally, since the increase in interest rate does not mean increase in expected rate of inflation and vice versa, these two variables cannot be used interchangeably. In fact, we can apply two variables as an approximate of each other if the domain of variation of the second variable is somehow a positive monotonic transformation of the domain of the first variable. In other words, the second variable should be converted to the first variable by two parameters of shift and scale parameters.

However, removing interest rate from the model with the above explanations however might create some special theoretical and practical problems in the model. One solution for this problem is to apply classical demand for money in Iran. In this case, transaction demand for money would be the basic variable in the money demand function. Regarding the fact that the velocity of money would be varied in different kinds of money and in any monetary innovations, the demand of money for the liquidity components would be defined by three separate equations, and real demand for demand deposits, time deposits and notes and coins would be related to gross domestic product. In fact, these equations relate the money sector to the real sector and prices.

Another solution would be to specify the duality of Iran's money market in the model. However, we tried to specify the behavioral effects of interest rate on the supply and demand for money resources in two organized (banking) and non-organized (nonbanking) monetary sectors.

In the organized market, the supply of banking resources to private and public sectors is a positive function of credit facilities' interest rates. The demand for liquidity components such as demand deposit, time deposit and notes and coins are defined as a function of deposits' interest rates in the banking system and free market interest rate in the non-organized money market. These equations relate the monetary sector to the real sector of the economy. On the other hand, by relating the investment demand as a function of credit facilities interest rate and non-organized market interest rate, the connection between the nominal and real sector of the model with monetary sector becomes stronger. The interest rate in the non-organized market would be determined as an endogenous variable from the intersection of demand and supply of investment and saving resources.

2-1-3 Public Sector

In this section, we define revenue and expenditure of government. Government expenditure includes current, development, special, special payment and investment in abroad. All of them, with the exception of special budget are exogenous. This variable is exogenous because, by law, government can spend this budget if she can finance it by some special revenues. The government revenue consists of oil and petrochemical products revenue, taxes, special revenues, miscellaneous revenue and revenue of foreign exchange sale. The latter revenues are resulting from government foreign exchange sales in non-official foreign exchange market. The tax revenue is divided into direct and indirect taxes. The direct taxes are a direct function of nonoil gross domestic expenditures at current prices and also a function of direct tax income in previous year. Indirect tax is a function of current consumption and import of goods at current prices. Miscellaneous revenue and special revenues are also a function of current gross domestic product. The oil revenue in dollar value is defined by the oil export and domestic oil consumption and the local price of petrochemical products. Budget deficit, as difference of total revenues and expenditures, is related to the banking system resources, and connect public and monetary sector in the model.

2-1-4 Real Sector

The operational mechanism in real sector is defined by two ways, first, by calculations of national product and second, by national expenditure. The nonoil products function is a perfect substitutable production function, so connects to labor and capital markets. The nonoil products along with the value added of the oil sector would make the gross domestic product. The gross domestic expenditures is the sum of private consumption expenditures and public expenditures and private and public investment and net export. Each of these variables is function of some special variables. The private consumption is a function of disposable income. Government consumption and investment expenditures are both calculated as components of government budget expenditures at constant prices. The private investment as a demand function is a function of gross domestic product and the previous years' investment and imports. The exports and imports at Rial values are defined by converting from their dollar values.

The total difference between gross domestic product and gross domestic expenditure is equal to statistical discrepancies and change in inventory.

By adding terms of trade to gross domestic product we will have gross domestic income. The gross national expenditure and gross national income are defined by adding net factor income from abroad to gross domestic expenditure and gross domestic income. The net factor income from abroad is defined from regressions in dollar values at constant prices. The necessary functions for calculating the capital stock and depreciation at constant prices have also been defined in this sector. The net indirect taxes variable is the difference between subsidies and indirect taxes which along with depreciation are subtracted from gross national income and so will define national income.

2-1-5 Nominal Section

The current variables are also defined with the same mechanism as real sector. In this sector, all components of expenditure and product are defined at current prices in order to apply them for calculating implicit price deflators. Almost all equations in real sector (at constant prices) are defined in the nominal sector at current prices. The terms of trade is an exception which is not defined in nominal sector.

2-1-6 Price Section

In this section, various types of price indices as implicit price deflators for products and expenditures, retail and wholesale price indices and their main components as the imported goods, exported goods and home produced and consumed goods; and effective and regular market exchange rates of dollar and interest rate in non-organized money market are specified. The implicit price deflators are defined by dividing their current price values of nominal sector to corresponding variables at constant prices in real sector. The implicit price deflators for import, export and net factor income from abroad and their components, and also the value added of the oil sector, the private and public investment, the gross domestic and national output and expenditure, the price index of capital stock, disposable income, the net indirect taxes, depreciation, private and public sectors consumption and so on are all available in the model. The wholesale price indices are defined from the relation of this index to price indices from export, import and nonoil product and finally, we defined inflation rate of this index as an endogenous variable. The retail price index is a function of gross domestic product implicit price deflator and its inflation rate is defined as endogenous in the model. The non-official market exchange rate is calculated in respect to national and foreign money supplies and the amount of foreign currency sold in the non-official market. The effective exchange rate is defined as the weighted average of official and non-official exchange rates. The interest rate in the non-organized market is defined from the supply and demand for investment and saving. Since, the official (banking) interest rates are determined by the Money and Credit Council, this variable is regarded as exogenous in the model.

2-1-7 Labor Market

The labor market consists of two parts, supply and demand for labor. Demand for labor is a function of real wage and output. Supply of labor is a function of nominal wage and active population. The active population is related to total population with an equation. The number of unemployed persons and the unemployment rate are also calculated in this sector.

2-2 Verifying the Identities

Since all identities in the model should be proved for all of observations, before estimation and building the model, all equations are controlled. For the equations with different amounts in the two sides, we did some special approaches as follow:

In most of identities we observed that the right and left hand sides of identities were not equal. That is, the identity does not satisfy when real data is used. Consider the following example:

(per barrel oil price in dollar)×(barrels of exported oil) ≠ (exported oil revenue)

$Y_t \neq X_t \,.\, P_t$

We explained the reason of this inequality. In most of times such inequalities will happen. Different approaches will be applied in this regard:

2-2-1 Method 1: Artificial Correctness of Data

In this method, we just change the variables with most error and use a proxy variable for it, and change the inequality to equality. In other words, in the above equation we calculate:

$PP_t = Y_t / X_t$.

Then, we put PP_t instead of P_t, so the equation would be in the form of :

$Y_t = X_t \,.\, PP_t$

If, P_t and its substitute variable PP_t were exogenous variables, then systematic effects of this manipulation would be less in comparison to considering P_t as an endogenous variable.

2-2-2 Method 2: Using Add Factor

In this method, we define the differences of the right and left hand side as a residual term and add it to the right hand side of the equation as follows:

$Res_t = Y_t - X_t . P_t$

and then we define the necessary identity as:

$Y_t = X_t . P_t + Res_t$

In this method, the first inequality is changed to equality, but a residual term is also appeared in the identity, which in time of simulation and especially estimation it would create redundant reflections. In simulation of the model, we may add the calculated add factors amounts for $Res_{t,}$ but for prediction period we don't have any valuable figure. Usually, we will put zero for this variable in ex-ante sample period. If the Res_t is a random variable satisfying classical regression assumptions for random error term, then equating this variable to zero for prediction period will not so harm the results of prediction. But if, the expected value of add factor were not equal to zero or its variance were not constant or the series were auto-regressive, in this case, using this method cause some disappeared biases in the predicted values of endogenous variables. All of these difficulties also exist in making simulation in the sample but as we have the least Res_t in the sample period, it would have less side effects on statistical properties of estimators. But however, it will cause good appearance for simulated ex-post values but make biases in prediction of ex-ante forecast.

2-2-3 Method 3: Bridge Regression without Residual Term

In this method the regarded inequality is defined as a probabilistic regression relation and we try to obtain the existing relation between the left and right hand sides' values mostly as a simple linear regression with minimizing the differences between the right and left hand sides' amounts. In other words, the above inequality is defined as following regression model:

$$Y_t = \alpha + \beta X_t . P_t + u_t$$

In which, α and β are unknown parameters and u_t is an error term. We can estimate α and β by ordinary least squares method. In other words, our identity in the model will be in the form of:

$$\hat{Y}_t = \hat{\alpha} + \hat{\beta} . X_t P_t$$

In this method we don't have the previous method difficulties and the defined identity is considered as a probabilistic relation. The simulation results for in-sample period will not have any error term and in prediction for out-sample period there is no need to determine u_t values. Most of these regressions in fact have very high R^2 levels.

2-2-4 Method 4: Bridge Regression with Residual Term

This method is also the same as previous method but the regarded identity is defined as follow:

$$Y_t = \hat{\alpha} + \hat{\beta} X_t . P_t + u_t$$

This kind of specification would cause in-sample simulation be better than the third method. In out-sample forecast, as the mean of u_t is equal to zero, we can assume zero quantities for u_t and base our forecasting upon it. But, since zero is an unbiased estimate and not a real value of u_t, so it causes predictions to loose their small sample properties and get only asymptotic properties. It is worth mentioning that in this method, at first, we estimate the regression equation defined by the third method and then obtain the $\hat{u}_t$ from the following relation and enter it in above relation in form of a time series data. So the above equation will finally be used in simulation and prediction of the model:

$$\hat{u}_t = Y_t - \hat{\alpha} - \hat{\beta}.X_t.P_t$$

This method is also defined as add factor method which econometric softwares have provided special algorithm for it. The add factor can be put in or take from the equations in different situations. For example, for predicting out of sample, we apply the add factor for all equations and identities – in case of errors in-sample errors– and bridge regressions and behavioral equations for making predicted figures closer to real figures. Also for shock analyzing or different policy making for some equations we enter the add factors. All of these situations depend upon the different properties of the model.

2-3 Stock and Flow Variables Relations

In different sections of the model, for some equations we need to relate flow variables to stock variables. For example, we can mention the relation between balance of payments and net foreign asset of central bank or relation between government budget deficit and net claim of banking system to government. If we define a simple regression as follow:

The flow variable = f(stock variable) + disturbance term.

The specified regression, in fact, will suffer from strong specification error. To avoid this kind of error we may apply the following two methods.

2-3-1 Method 1: Converting Stock Variable to Flow Variable

In this method, we take a first order difference from the stock variable to convert it to a flow variable and we put two flow variables in the left and right hand sides of the regression:

The flow variable = f [Δ(stock variable)] + the residual term.

2-3-2 Method 2: Converting Flow Variable to Stock Variable

In this method the flow variable from the far last periods till present time is accumulated annually. The resulted variable would be one stock variable. Then the following specification is used in the model:

∑ (flow variable) = f (stock variable) + disturbance term.

The first method is application of discrete derivative and the second method is application of discrete integration in converting stock and flow variables to each other. These two methods have one similarity from theoretical/mathematical point of view but they have different regression properties, because specification and probability distribution of disturbance term are different. Thus the choice and application of the first and second method should be done according to the evaluation of disturbance term in each of the equations. In selecting method, we choose the method that its disturbance term has closer similarity to classical regression disturbance term assumptions.

2-4 Time Structure and Lagged Variables

Principally, models can be classified into long-run, medium term and short-run models. The structure of a short-run model is designed to possess the ability of explaining exogenous variables fluctuations effects on the endogenous variables changes in the short-run, e.g., monthly and seasonal models. These models are used to forecast a period of maximum of 1 year ahead. These models would be good predictors if all used variables were stable and unexplained factors outside of the model have less important role in the behavior of the model and its variables. The model structure of this class is strongly based on lagged exogenous and endogenous variables. For this reason the likelihood of divergence for predicting more than one year ahead is higher than other classes. In these models, the time variables are less directly entered into the model and model builder mostly emphasize on demand side of the model. Long-run models are designed for more than five years prediction and analysis. In long-run models, the lagged variables would not more or less enter the model. The trend variables generally appear as direct variables in the model and the model structure emphasizes on the supply side and variables such as capital stocks would appear in the model. In this class, equations have less accuracy on turning points.

The third class of models is medium term models. They would be applied for one to less than five years predictions. Model builders use some lagged variables in these models but with more simple structure than the short-run models. The accuracy of the models most of the times is concentrated on turning points and these models try to find fluctuations during a medium term. This kind of models would emphasis more on both supply and demand sides. The current designed model is for medium term and in specifying the model we mostly emphasized on accruing properties of these models.

2-5 Structural Changes and Qualitative Variables

Since 1959, lots of changes happened in Iran's economy which had so much effect on economic variables trends. The effects of some shocks were instantaneously and effects of some other were with some lags. However, ignorance of these changes would create specification errors in the model. Considering the fact that in simultaneous equations every specification error practically would go through other equations, so by applying these qualitative variables, we may avoid misspecification problem.

The other worth mentioning point would be the effect of ups and downs fluctuations of data series due to different structural changes. Outliers have important effects on least squares estimators, since in minimizing sum of squared residuals, larger errors have more leverage influence on the regression and the regression would tend toward the side of outliers. If we know that the error in one year is due to some special miscalculations or other reasons such as misbalancing of different series, we can neutralize their effects by applying some qualitative dummy variables. This means that practically, by loosing one degree of freedom and entering one parameter due to one dummy variable, we ignore that observation from all of our calculations. If the qualitative dummy variable is defined for some observations, it means that by loosing one degree of freedom, we ignore the effect of those year mean errors from the observed values of those years. Anyhow, due to Iran's statistical and economic conditions, we are obliged to apply this kind of variables. Some of major structural changes are listed as follows:

Structural changes	Period
Pre-oil price shock	1959-1973
Oil price shock	1974
Pre revolution period and after oil price shock	1975-1977
Revolution	1978
Pahlavi government	1959-1978
After revolution period	1979-…..
War	1980-1988
Non-usury banking	1993-…..
After war period	1983-…..
Foreign debt	1990-1993
Adjustment policies	1990-1994
Reconstruction policies	1990-1995
Export exchange rate devaluation	1991-…..
Exchange rate devaluation	1993-…..
Stability policies	1996-…..
President and country management changes	1997-2005
Civilized community policies	1998
Economic makeup policy	1999
Foreign exchange reserve fund	2000-…..
Oil price shock	2000
Exchange rate peg	2000
Unification of exchange rates	2001-…..

2-6 Model Specification

2-6-1- Foreign Sector Identities and Equations

1: Balance of trade, million Dollars

IRTBD = IRXGD - IRMGD

This equation is for trade balance of export and import of goods in an identity form. It is worth mentioning that determining export and import quantities of goods have special problems in Iran. For example, in calculating import, the problem is conversion from Rial to Dollar which data are taken from Custom and Duties Office of Iran. Despite different exchange rates for imports, the registered quantities for imports at the Custom Office of country are in official exchange rate, so converting these quantities to dollar value would make some biases in dollar values of imports. In the year 1993, this problem became harder due to change in exchange rate for imports and exports and advance payment for returning export revenues as well as foreign exchange obligations from November 1993 on (calculated in floating exchange rate of 1750 Rials). On the other hand, during the years before 1988, value of imports in trade statistics were included insurance and freight cost which were considered in the figures of 1988 and the years after, but for the years before 1988, the problem did exist. Principally the imports and exports of goods should be based on FOB value, and the freight and insurance costs are considered in import and export of services. From the year 1988 quantities of imports were adjusted again, the values of imports were calculated after adjusting the invoice registration fee. In the recent years, the IMF standards were applied, which can certainly improve the provided figures.

2: Balance of services, million Dollars

IRSBD = IRXSD - IRMSD

This identity calculates net balance of services export and import. Balance of services in this equation is difference between import and export of factor and nonfactor services both.

3: Current account, million Dollars

IRCAD = IRTBD + IRSBD + IRNTRD

The right hand side of this equation asserts trade balance of goods and net export of services and net transfer payments to abroad. Since, we don't have any accurate series for transfer-payment in Iran; we assumed it as an exogenous variable, which will be explained more in next equations.

4: Balance of payments, million Dollars

IRBOPD = IRCAD + IRKAD + IRBOPEOD

This identity is sum of current account, capital account, errors and statistical discrepancies in balance of payments. Normally, accumulation of capital account during previous years ought to be nearly equal to foreign debts. In other words, change in foreign debt should be closely related to capital account in every year. Unfortunately, we could not find any rational relation between capital account figures and foreign debt in Iran. So, considering the matured debt repayment and debt time-rescheduling policies, capital account variable was regarded as exogenous variable. Regarding the vast range of variations of statistical discrepancies variable it was regarded as endogenous.

In Iran, balance of payments table does not exist for the beginning of the sample period (1959-1972), we applied the figures of "balance of foreign exchange" table instead. The great differences exist between the foreign exchange balance and balance of payments due to the method of making and application of each table, which made some problems in time series of these tables. One major problem which causes this difference is the application of cash and accrual accounting procedures which are used for foreign exchange and balance of payments accounts respectively.

5: Export of goods, million Dollars

IRXGD = IRXOILD + IRXGNOD

This identity is sum of oil and nonoil exports. All figures are at current prices.

6: Export of nonfactor services, million Dollars

IRXNFSD = IRXNFSDOP * OECDP

Export of nonfactor services in dollar is derived from multiplication of this variable at constant prices to price index of goods and services in OECD countries.

7: Import of nonfactor services, million Dollars

IRMNFSD = IRMNFSDCIFP * IRCIFP

Import of nonfactor services is asserted by multiplication of this variable at constant prices to price index of imported goods and services.

8: Export of nonoil goods, million Dollars

IRXGNOD = IRXGNODOP * OECDP

This identity gives the export quantity of nonoil goods at current oil prices by multiplication consumer price index in industrial countries (OECD) by quantity of nonoil export at constant prices.

9: Import of goods, million Dollars

IRMGD = IRMGDCIFP * IRCIFP

This identity converts the amount of import of goods (at constant prices) to the amount of import of goods (at current dollar prices). The applied price index is CIF price index of imports of goods and services. The import variable at constant prices will be used in import demand function. This equation relates import at constant prices to current dollar import.

10: Export of services, million Dollars

IRXSD = IRXNFSD + IRXFYSD

Export of services shows the sum of factor income receipts from abroad plus nonfactor income services export. Factor income services from abroad will be connected to net factor income from abroad in national accounts.

11: Import of services, million Dollars

IRMSD = IRMNFSD + IRMFYSD

Import of services is divided into import of factors income services from abroad and nonfactor services. The former variable is connected to net factor income from abroad in national accounts and the latter to the import of services part of national accounts.

12: Balance of factor income services, million Dollars

IRFYSBD = IRXFYSD - IRMFYSD

This equation is balance of receipts and payments of factor income services from abroad.

13: Balance of nonfactor income services, million Dollars

IRNFSBD = IRXNFSD - IRMNFSD

This equation gives the net balance of nonfactor income services.

14: Cumulative balance of payments, million Dollars

IRBOPDC = IRBOPDC(-1) + IRBOPD

This identity shows the calculation of cumulative balance of payments. It is equal to sum of previous year cumulative balance of payments and current year balance of payments. By this equation we will connect net foreign assets in banking system to balance of payments as will be explained later.

15: Balance of payments errors and omissions, million Dollars

IRBOPEOD = IRBOPEODC - IRBOPEODC(-1)

This equation asserts the statistical discrepancies between balance of payments and changes in net foreign assets account. It is equal to cumulated statistical errors difference between current year and cumulated statistical errors in previous year. The reason for applying cumulated error is taking advantage from the property of summation and average of errors, which are usually approach to zero in the long-run. The cumulated errors variable is an endogenous variable and is specified as an equation.

16: Cumulative capital account, million Dollars

IRKADC = IRKADC(-1) + IRKAD

This equation is the sum of cumulated capital account in previous year and current year. This variable then will be related to net foreign assets of banking system.

17: Cumulative current account, million Dollars

IRCADC = IRCADC(-1) + IRCAD

This equation is cumulated current account which is cumulated current account in previous year and current account of the current year.

18: Cumulative balance of trade, million Dollars

IRTBDC = IRTBDC(-1) + IRTBD

This equation is sum of previous year's cumulated trade balance and the trade balance of current year. This variable will be linked to net foreign assets account of banking system.

19: Cumulative balance of services, million Dollars

IRSBDC = IRSBDC(-1) + IRSBD

The cumulated services balance is equal to its lag plus the current services trade balance.

20: Net transfers, million Dollars

IRNTRD = IRNTRDC - IRNTRDC(-1)

Net transfer payment in each year is equal to the difference of cumulated trade balance in the current year and cumulated trade balance in previous year. This variable will later be connected to balance of payments account.

21: Cumulative factor income services balance, million Dollars

IRFYSBDC = IRFYSBDC(-1) + IRFYSBD

Cumulated factor income services from abroad equals to its lag plus factor income services from abroad in current year.

22: Cumulative nonfactor income services balance, million Dollars

IRNFSBDC = IRNFSBDC(-1) + IRNFSBD

This equation is sum of lag of cumulated nonfactor income services balance in previous year plus nonfactor income services of current year.

23: Export of oil, million Dollars

IRXOILD = IRWPOIL * IRXOILB

Oil export revenue in dollar will be obtained from multiplication of weighted price of each barrel of oil to the exported amount of oil. In theory, this equation should be an identity and instead of the weighted price of oil we should apply the effective oil price, but the statistics shows large discrepancies which might be resulted from the following points and more:

- Dollar revenue of export of oil also includes gas export revenue. Time series data about gas export and revenue is not accessible.

- Considering the special situation of Iran after 1979 revolution, especially the years of Iran-Iraq war and specially during the year 1985 which was the peak of war tensions, the registered oil exports are not equal to real oil export, one of the reasons of this discrepancy could be resulted from country's need to oil revenue and disregarding OPEC oil quotas during the critical conditions of the war. Also, because of Iraq attacks to oil tankers and destroying them in middle of the way, some more discrepancies arose that amount of exported oil could not be equal to the received revenue of oil export.
- Oil export revenue were derived from foreign exchange account in first years of the sample, while for the mid-sample period these figures were derived from balance of payments account. The figures of foreign exchange balance of country would not show the each year's exact oil export revenue. In this account, the figures are in cash values instead of accrued amounts. For example, as asserted in balance of payments notes and economic reports of Central Bank during the first years of the period 1959-1995, oil export revenues in each year were not equal to foreign exchange receipts resulted from oil export on the same year. For some period, oil was sold in form of advance payment and was booked in the revenue account of that year, but the oil was produced and exported in the next year. Also, in some other cases the oil was exported but its revenue was received in the years after, so its revenue was shown in the revenue account of the next year.
- Applying the average oil price in one year regarding to fluctuation of oil price during the whole year can make errors in measurements.
- Applying CIF and FOB prices in balance of payments account actually make discrepancies in cited identity. It is worth mentioning that oil export prices are calculated in FOB and costs of insurance and transportations must be shown in the service trade section.

- Barter transaction of oil by Oil Ministry for importing some oil products and equipment; actually make some errors in the identity.
- Other error relating to oil (export) granted to some countries.

The above-mentioned problems can make inequality in foreign exchange revenue of oil export identity. Later, we will talk more about how to solve this problem.

101: Export of oil, million barrels / year

IRXOILB = IRXOILB(-1) + B(1011) * (IRYOILB - IRYOILB(-1))

In foreign sector of the model, oil duality of Iran's economy is clear. The export amount of oil in terms of barrels and on the basis of oil production capacity is considered as an export supply function. Due to the OPEC quota system price has no role in supply function of oil.

Also, as far as domestic and intermediate consumptions of oil should be greater than its export, we expect that the related coefficient in this equation be less than one. Regarding to the errors which exist in export of oil series, and for decreasing effect of these errors, change of oil export is considered as a function of change in oil production to promote estimate of prediction of this variable.

102: Export of nonfactor services, million Dollars

IRXNFSDOP = IRXNFSDOP(-1) + B(1021) * IREENOIL + B(1022) * (IRGDPNF - IRGDPNF(-1)) + B(1023) * IRD79

Export of nonfactors services is considered as a supply function and its independent variables are its lagged variable and effective exchange rate for nonoil exports and first difference of gross nonoil domestic products. Because of statistical discrepancies in balance of payments account as well as imposing nontariff barriers, export of nonfactors services has a lot of fluctuations during the sample period. Applying qualitative dummy variables will promote its fit.

103: Import of nonfactor services, million Dollars

IRMNFSDCIFP = IRMNFSDCIFP(-1) + B(1030) + B(1031) * (IREENOIL * IRCIFP / IRWPI - IREENOIL(-1)*IRCIFP(-1) / IRWPI(-1)) + B(1032) * (IRGDPM - IRGDPM(-1)) + B(1033) * (IRD77 + IRD79 + IRD88 + IRD02)

Import of nonfactor services is defined as a function of this variable in previous year and amount of real effective exchange rate for nonoil goods (which is calculated from multiplication of relative price index of imported goods and services to domestic wholesale price index by effective exchange rate for nonoil goods) and gross domestic product at constant prices at market price. Our expectation about the estimated coefficients is the same as the coefficients for an import demand function. This variable has also a lot of fluctuations during the sample that necessitates dummy variables.

104: Real import of goods, million Dollars

IRMGDCIFP = B(1040) + B(1041) * (IRXGD + IRXSD) + B(1042) * IREENOIL + B(1043) * IRGDPM + B(1044) * IRCIFP + B(1045) * IRKAD + B(1046) * IRD79

Import demand function is a function of effective exchange rate, CIF price index of imported goods, goods and services export revenue, real gross domestic product at market price and capital account. The capital account enters this equation to show the borrowing effects of previous years as necessary foreign exchange resources for import of goods in excess of export revenue. The reason for entering gross domestic product in this equation is for creating a relation between real sector economy and foreign sector. GDP variable consists of absorption and trade balance. Trade balance has a very small share in this variable, because trade balance means net value of exports of goods and services and during the long-run this balance often tends to zero.

105: Real export of nonoil goods, million Dollars

IRXGNODOP = B(1050) + B(1051) * IREX * OECDP / IRWPI + B(1052) * IRXGNODOP(-1) + B(1053) * IRGDPNF

This equation is a supply function. The export exchange rate is converted to real export exchange rate by applying OECD consumer price index and domestic wholesale price index of goods and services. Nonoil export at constant prices in previous year and nonoil gross domestic product are the other variables of this equation. These two latest variables came into equation for asserting capability of producing and exporting nonoil goods.

106: Import of factor income services, million Dollars

IRMFYSD = B(1060) + (B(1061) + B(1062) * (1 - IRD5977)) * IRKADC * LIBOR / 100 + B(1063) * IRMFYSD(-1) + B(1064) * IRD5978 * IRMGD + B(1065) * IRD5977 + B(1066) * IRD0208

Payment to factor income services from abroad includes interest payment for borrowed capital from abroad and payments to foreign employees. Considering the fact that series of foreign debt of Iran is not reliable due to the errors in capital account, we tried to apply cumulated variable of capital account as presented in the first method of relating flow and stock variables. In this equation by entering lagged dependent variable in right hand side, actually, the left hand side variable is defined as a function of factor payments in abroad in previous year. That is some part of changes in each year is considered as a function of interest payment of previous year in capital account. The applied interest rate is the London interbank offer rate for six months dollar deposits. The import variable in this equation makes the factor payments in abroad as a function of imports of goods.

107: Export of factor income services, million Dollars

IRXFYSD = B(1070) + B(1071) * IRGEFIDC + B(1072) * (1 - IRD5978) + B(1073) * IRXFYSD(-1) + B(1074) * IRD0108

Factors income receipts from abroad is a function of government's previous cumulated investment in abroad variable and amount of export of factor income services from abroad in previous year.

108: Cumulative balance of payments errors and omissions, million Dollars

IRBOPEODC = B(1081) * IRKADC + B(1082) * IRTBDC + B(1083) * IRFYSBDC + B(1084) * IRNFSBDC + B(1085) * IRD84 + B(1086) * IRD9495

Cumulated discrepancies in balance of payments account is a function of cumulated balances of the components of the balance of payments. In other words, it is a function of cumulated trade balance, cumulated capital account, cumulated services balance of nonfactor income services and cumulated services balance of factor income services from abroad. If this equation is omitted from the whole system, then the above variable should be considered as exogenous which reduces the predictability of model. The structural change of this variable during the sample period is softened by dummy variables.

109: Cumulative net transfers, million Dollars

IRNTRDC = IRNTRDC(-1) + (B(1090) + B(1091) * IRKADC + B(1092) * IRTBDC + B(1093) * IRFYSBDC + B(1094) * IRNFSBDC + B(1095) * IRBOPEODC) * (1 + B(1096) * IRD5988) + B(1097) * IRD95 + B(1098) * IRD92

For making this variable endogenous, the cumulated transfer payment is considered as a function of cumulated balance of other components of balance of payments. In other words, the cumulated transfer payment balance is a function of cumulated trade balance, cumulated capital balance, cumulated receipts of factor income services from abroad, and receipt of nonfactor income services and cumulated errors and statistical discrepancies of balance of payments. Entering the last variable is due to existing strong relation between transfer payment balance and cumulated statistical discrepancies during the recent years. Dummy variables usage Tis due to structural changes of this variable during the sample period.

2-6-2- Monetary Sector Identities and Equations

201: Net claim of banking system to government sector (including public government), billion Rials

IRM2NGV = IRM2NGGV + IRM2NGSV

From accounting point of view in assets and liabilities of banking system, public (government) sector consists of public government, governmental and quasi-governmental organizations and institutions. Net increase of public sector debt to banking system will book in net claim of banking system to public sector account and will result to an increase in this account to the same amount. In other words, this figure consists of net claims of the banking system to government and the affiliated governmental institutions and companies. For financing budget deficit, government uses different resources. The amount of budget deficit which is borrowed from banking system will increase net claims of banking systems to public sector. So, the net claims of banking system to public sector can be divided into two parts as public government and public sector without government.

202: Net claim of banking system to public government, billion Rials

IRM2NGGV = IRGBDVC + IRFEOAV + IROLVC

Government foreign obligation account leads to increase in banking system claims to government sector account. The obligatory notes of government annual budgets rule to increase banking system claims to public sector. Net claims of banking system to public sector is always a stock variable, while, budget deficit and annual obligatory notes' amounts are flow variables. We applied the second method of connecting flow variable to stock variable here. So, here we use cumulated budget deficit (stock variable) and foreign exchange obligations account (stock variable) and cumulated obligatory facilities (stock variable) on the right hand side of the equation. Net claim of banking system to public government is considered as a stock variable.

203: Net claim of banking system to government sector (excluding public government) at constant prices, billion Rials

IRM2NGSV = IRM2NGSVPGDPM * IRPGDPM

Net claims of banking system to public sector (without public government) at constant prices can be converted to current price by applying GDP price deflator at market price.

204: Net claim of banking system to private sector at constant prices, billion Rials

IRM2NPV = IRM2NPVPGDPM * IRPGDPM

This equation converts real net claims of banking system to private sector to current value using GDP price deflator at market price.

205: Cumulative obligatory loans in government budget, billion Rials

IROLVC = IROLVC(-1) + IROLV

This equation cumulates obligatory loans of government budget notes.

206: Obligatory loans in government budget, billion Rials

IROLV = IROLPV + IROLGV

This equation adds private and public obligatory loans of government budget notes.

207: Demand deposits of private sector, billion Rials

IRDDV = IRDDVPGDPM * IRPGDPM

Demand deposit of private sector is equal to multiplication of this variable at constant prices by gross domestic product at market price price deflator.

208: Saving and time deposits of private sector, billion Rials

IRSDV = IRSDVPGDPM * IRPGDPM

Saving and time deposits of private sector variable is derived from multiplication of its real value by price deflator of GDP at market price.

209: Currency in hands of public, billion Rials

IRCUV = IRCUVPGDPM * IRPGDPM

Currency in hands of public variable is derived by multiplication of currency in hands of public at constant prices by GDP at market price implicit price deflator.

210: Liquidity, billion Rials

IRM2V = IRCUV + IRDDV + IRSDV

This is an identity from liability side of balance sheet of baking system which is equal to notes and coins in hands of public plus demand and saving deposits.

211: Net foreign assets of banking system, billion Rials

IRM2NFAV = IRM2NFAD / (((1 - IRD93 - IRD90 - IRD91 - IRD92) / IREO + IRD93 / 1748 + IRD90 / 221.89 + IRD91 / 351.9 + IRD92 / 641.2) * 1000)

Foreign asset is booked in Rial value in asset side of banking system assets and liabilities account. Every year due to changes in exchange rate and different national and international considerations as signiorage restrictions, neutralization, sterilization policies and so on, the amount of foreign exchange assets is converted by different exchange rates. These rates often are far from official exchange rate. In this model, we applied the official exchange rate. During the years 1990-1993 central bank used different exchange rates for converting each item of foreign assets account. This case has been applied in the model through using dummy variables.

212: Net worth and other items net of banking system, billion Rials

IRM2NWV = IRM2V - (IRM2NPV + IRM2NGV + IRM2NFAV)

Net worth and other items net of banking system is difference between liquidity and other uses of monetary base of banking system. In simulation any endogenous variable should locate once at left hand side of one equation throughout the system, so we will write this equation in terms of net other assets and capital account of the banking system instead of liquidity.

301: Net claim of banking system to private sector at constant prices, billion Rials

IRM2NPVPGDPM = IRM2NPVPGDPM(-1) + B(3011) * IRIRL + B(3012) * IRD7576

This equation shows the banking system loans to private sector. Original variables in right side are loan interest rate of banking system and net claim of banking system to private sector with one lag. We expect that the coefficient of loan interest rate of the banking system be positive.

302: Net claim of banking system to government sector (excluding public government) at constant prices, billion Rials

IRM2NGSVPGDPM = B(3020) + B(3021) * IRM2NGSVPGDPM(-1) + B(3022) * IRIRL + B(3023) * IRD9497 + B(3024) * IRD5978 * IRM2NGSVPGDPM(-1)

This variable is one of the components of the monetary uses of banking system, in other words, amount of money supplied to public sector. In general, all institutions which are controlled by government and their capital belong to whole people are categorized in this item except central government. The real money supply to these institutions is a function of previous loans and weighted rate of interest of banking loans.

303: Net foreign assets of banking system, million Dollars

IRM2NFAD = B(3031) * IRBOPDC + B(3032) * IRM2NFAD(-1) + B(3033) * IRD8589 + B(3034) * IRD9708

Principally, change in net foreign asset of central bank must be equal to balance of payments in the same year. In other words, this equation should be defined as an identity. But, because of problems in balance of payments account and moreover, the net value of central and commercial banks' assets are not booked in dollar, this identity -as defined before in verifying identities- is defined as a regression equation. On the other hand, because of some legal restrictions and sterilization policies, the applied exchange rates for converting foreign assets from dollar to Rial are different from official one. So, the time series of net foreign assets in dollar is not a favorable time series considering large differences between applied and official exchange rate. This series shows a lot of outliers e.g., in the year 1993, because of applying sterilization policy, this situation is very clear.

Balance of payments and net foreign assets of banking system are flow and stock variables respectively. By applying the second method which was mentioned about the relation between stock and flow variables, the components of balance of payments for the whole years were cumulated and used in the right hand side of the equation. Inserting the left hand side variable into right hand side with a time lag is to stabilize the large errors of this variable and its weighted distribution between the two cumulated balance of payments variable in the same year and net foreign asset in previous year. During the sample period, with adding an add factor, this equation will become an identity, but for ex-post sample period for prediction, we uses the add factor value equal to zero. This is the fourth method of verifying identities as explained before.

304: Real demand deposits of private sector, billion Rials

IRDDVPGDPM = B(3041) * IRGDPM + B(3042) * IRDDVPGDPM(-1) + B(3043) * IRIRS + B(3044) * IRIRNB

This equation shows that demand deposit at constant prices is a function of its lagged variable and gross domestic product and weighted deposit's interest rates and non-organized money market interest rate. Considering velocity of circulation of money – that is different for each component of liquidity- and also regarding the classical theory of transaction demand for money, this equation is defined as a linear function of gross domestic product. In this equation, the duality of the interest rate is evident. GDP deflator at market price is used to make real demand deposits.

305: Real saving and time deposits of private sector, billion Rials

IRSDVPGDPM = B(3050) + B(3051) * IRGDPM + B(3052) * IRIRS + B(3053) * IRSDVPGDPM(-1)

This equation defines demand of banking system for time and saving deposits. Time deposit demand at constant prices is a function of this variable in previous year and gross domestic product and interest rates of deposits. The GDP deflator was applied to convert nominal value of time deposit to real value.

306: Real currency in hands of public, billion Rials

IRCUVPGDPM = B(3060) + B(3061) * IRCUVPGDPM(-1) + B(3062) * IRGDPM + B(3063) * IRD5977 + B(3064) * IRIRL + B(3065) * IRIRNB + B(3066) * IRD79

Demand for notes and coins variable is a function of its lagged variable, the gross domestic product at constant prices and loans interest rate in non-organized money market. GDP deflator is applied to convert nominal value of notes and coins to real value.

2-6-3- Government Sector Identities and Equations

401: Cumulative government budget deficit, billion Rials

IRGBDVC = IRGBDVC(-1) - IRGBDV

Government cumulated budget deficit in each year is equal to the amount of this variable in previous year minus budget deficit of current year. The latter deduction is because the budget deficit is difference of revenue and expenditure, as a result it is negative figure in nature which by applying another negative sign becomes positive and cumulated budget deficit becomes a series of positive components. We have done this type of calculation because we wanted to relate flow to stock variable.

402: Government revenue, billion Rials

IRGRV = IRGROILV + IRGRTV + IRGRMV + IRGRDSV + IRGRSV

Government revenue is sum of oil revenue of government plus government tax revenue and other government revenues and miscellaneous and special revenues and revenue of selling foreign exchange in nonofficial market.

403: Government tax revenue, billion Rials

IRGRTV = IRGRTDV + IRGRTIV

This variable is made of direct and indirect tax revenues.

404: Government expenditure, billion Rials

IRGEV = IRGECV + IRGEDV + IRGESV + IRGESPV + IRGEFIV

Government expenditures variable is sum of current expenditures plus development expenditures plus special expenditures and special transfer payments and capital investment expenditures in abroad.

405: Government budget deficit, billion Rials

IRGBDV = IRGRV - IRGEV

This variable is derived from difference of government revenues and expenditures. The budget deficit is considered as a negative value and the budget surplus considered as positive.

406: Government special expenditures, billion Rials

IRGESV = IRGRSV

This equation shows that the special government expenditure is equal to special revenue because according to law, these two variables must be equal.

407: Cumulative government expenditures in foreign investment, million Dollars

IRGEFIDC = IRGEFIDC(-1) + IRGEFIV / IREO * 1000

This identity applies official exchange rate for converting government investment in abroad and by cumulating all expenditure in dollar value in previous years and adding the current year government investment expenditure in abroad the cumulative government expenditures in foreign investment variable is resulted.

501: Government indirect tax revenue, billion Rials

IRGRTIV = IRGRTIV(-1) + B(5011) * (IRMGV - IRMGV(-1)) + B(5012) * (IRCV - IRMGV - (IRCV(-1) - IRMGV(-1))) + B(5013) * IRD00 + B(5014) * IRD99

This equation gives government indirect tax revenue as a behavioral function of current values of total consumption and import of goods (in Rials).

502: Government oil revenue, billion Rials

IRGROILV = B(5021) * (1 - IRD93) * IREO * (IRXOILD / 1000 - IRGRDSV / IREM) + B(5022) * IRPDOIL * (IRYOILB - IRXOILB) + B(5023) * IRD93 * (0.58 * 1000 + 0.42 * (IREO -1000)) * (IRXOILD / 1000 - IRGRDSV / IREM) + B(5024) * IRD0008 + B(5025) * IRD9597

In this behavioral equation, amount of foreign exchange sell is converted to dollar ans is deducted from oil revenue. Official exchange rate converts it to Rials. In second expression, domestic price of oil is multiplied by domestic oil consumption. Remainder expressions are to convert oil export net of dollar sale to Rials. During the sample period, by adding an ad factor this equation will be in identity form but out of the sample the ad factor is set to zero. Here, we applied the fourth method of verifying identities with discrepancy errors.

503: Government miscellaneous revenue, billion Rials

IRGRMV = IRGRMV(-1) + B(5031) * (IROUTPUTV - IROUTPUTV(-1))

This variable is defined as a function of total current output.

504: Government special revenue, billion Rials

IRGRSV = IRGRSV(-1) + B(5040) * (IROUTPUTV - IROUTPUTV(-1))

This variable is a function of total current output.

505: Government direct tax revenue, billion Rials

IRGRTDV = IRGRTDV(-1) + B(5051)*(IROUTPUTV-IROUTPUTV(-1))

In this equation, direct tax revenue is a function of total current output and government direct tax revenue with one year time lag.

2-6-4- Real Sector Identities and Equations

601: Aggregate demand at constant prices, billion Rials

IRAD = IRINPUT + IRC + IRG + IRI + IRDIS + IRX + IRTOT

Aggregate demand is sum of inputs of production, consumption, government expenditure, investment, statistical discrepancies, and export at constant prices and terms of trade.

602: Aggregate supply at constant prices, billion Rials

IRAS = IROUTPUT + IRNIT + IRM + IRTOT

Aggregate supply is sum of total output and net indirect taxes, import at constant prices and terms of trade.

603: Aggregate output at constant prices, billion Rials

IROUTPUT = IRINPUT + IRGDPF

Total output at constant prices is sum of gross domestic product at factor cost and intermediate inputs.

604: Gross national saving at constant prices, billion Rials

IRGNS = IRI + IRII + IRBOT + IRNFY + IRTOT

According to national accounting definition, national gross saving is sum of investment, change in inventory and net factor income from abroad and terms of trade.

605: Net national saving at constant prices, billion Rials

IRNNS = IRGNS - IRCCA

This variable is derived by deducting depreciation (capital consumption allowances) from gross national saving.

606: Export at constant prices, billion Rials

IRX = IRXOIL + IRXNOILG + IRXNFS

This equation is derived from export of goods and services in national accounts at constant prices as sum of export of goods, oil and nonfactor income services. According to national accounting, factor income services from abroad variable is a component of exports in balance of payments accounts.

607: Import at constant prices, billion Rials

IRM = IRMG + IRMNFS

Import at constant prices is derived from import of goods and nonfactor income services from abroad.

608: Balance of trade at constant prices, billion Rials

IRBOT = IRX - IRM

Real trade balance is derived from difference between real exports and imports. It is worth mentioning that this balance is not equal to trade balance in balance of payments account. In trade balance we do not enter the figures of net factors income services from abroad.

609: Gross domestic expenditure at market price at constant prices, billion Rials

IRGDEM = IRC + IRG + IRI + IRBOT + IRDIS

Gross domestic expenditure at market price and constant prices is sum of private consumption, government expenditure, investment and statistical discrepancies. Change in inventory is defined in statistical discrepancies.

610: Private saving at constant prices, billion Rials

IRSP = IRYD - IRC

This variable is derived from difference between disposable income and private consumption.

611: Terms of trade, billion Rials

IRTOT = 2 * ((IRXV * IRM) - (IRMV * IRX)) / (IRXV + IRMV)

This figure in Iran's national accounting is derived from Kurbis-Kurabayashi method for calculating terms of trade.

612: Gross domestic income at market price at constant prices, billion Rials

IRGDIM = IRGDPM + IRTOT

This variable is equal to GDP at market price plus terms of trade.

613: Discrepancies at constant prices, billion Rials

IRDIS = IRGDPM - (IRC + IRG + IRI + IRBOT)

This variable by definition is derived from difference of gross domestic product and gross domestic expenditure as sum of private and government consumptions and total investment and net export (or trade balance).

614: Gross national product at market price at constant prices, billion Rials

IRGNPM = IRGDPM + IRNFY

GNP at market price is equal to GDP plus net factor income from abroad.

615: Gross national income at market price at constant prices, billion Rials

IRGNIM = IRGNPM + IRTOT

Gross national income is equal to sum of gross domestic product plus terms of trade.

616: Net national income at factor cost at constant prices, billion Rials

IRNNIF = IRGNIM - IRCCA - IRNIT

Net national income is equal to gross national income minus depreciation plus net indirect taxes.

617: Net factor income at constant prices, billion Rials

IRNFY = IRXFY - IRMFY

This variable is equal to difference of receipts and payments of factor income from abroad.

618: Net indirect taxes at constant prices, billion Rials

IRNIT = IRIT - IRSUB

Net indirect taxes at constant prices variable is derived from subtracting current subsidies from total indirect taxes.

619: Capital stock at constant prices, billion Rials

IRK = IRK(-1) + IRI - IRCCA

Capital stock at constant prices is equal to sum of its lagged variable plus total current investment minus fixed capital depreciation. This series for longer term become more rational due to depreciation of fixed capital.

620: Gross domestic product at market price at constant prices, billion Rials

IRGDPM = IRGDPNF + IRVAOIL + IRNIT

This variable is derived from sum of nonoil gross domestic product at factor cost plus oil sector value added and net indirect taxes. The reason for adding the latter variable is the difference between factor cost GDP in right hand side and market price definition in left hand side of the equation.

621: Disposable income at constant prices, billion Rials

IRYD = IRGDPNF + IRNFY - IRCCA - IRGRTDV / IRPIT

This variable is equal to sum of gross domestic product at market price plus net factor income from abroad minus fixed capital depreciation and direct tax at constant prices. We didn't subtract net indirect taxes from the right hand side because nonoil gross domestic product is at factor cost.

The reason for separating taxes into indirect and direct is due to different indirect tax definitions in government budget and national accounting. In national accounts tax and subsidy are calculated for central government (as its budget definition), Consumers and Producers Protection Organization, municipalities and Centers for Provisions and Distributions. So, indirect taxes derived from national accounts and direct taxes derived from government budget are used for calculating disposable income.

Subtracting total taxes from nonoil gross domestic product at market price converts it to GDP at factor cost and omits the effect of government through vanishing the effect of direct taxes. Subtracting depreciation converts gross to net value and adding net factor income from abroad will change this variable from domestic to national value, so disposable income of private sector will be determined.

622: Investment at constant prices, billion Rials

IRI = IRIP + IRIG

Total investment at constant prices derived from sum of private investment and government investment.

623: Indirect taxes at constant prices, billion Rials

IRIT = IRITV / IRPIT

Indirect taxes at constant prices variable is equal to taxes at current prices divided by its implicit price deflator.

624: Subsidies at constant prices, billion Rials

IRSUB = IRSUBV / IRPSUB

This variable is derived by dividing current value to its price deflator.

625: Gross domestic product at factor cost at constant prices, billion Rials

IRGDPF = IRGDPNF + IRVAOIL

Gross domestic product at factor cost is equal to sum of nonoil gross domestic product at factor cost plus value added of oil sector.

701: Government investment at constant prices, billion Rials

IRIG = IRIG(-1) + B(7011) * (IRGEDV/IRWPI -IRGEDV(-1) /IRWPI(-1)) + B(7012) * IRD76 + B(7013) * IRD77 + B(7014) * IRD78 + B(7015) * IRD79

Government investment definition in national accounting is different from government development expenditure in budget. For finding a relation between them, we assume government investment as a function of development expenditure in budget which is converted to constant prices by applying wholesale price index.

702: Government consumption at constant prices, billion Rials

IRG = IRG(-1) + B(7021)*((IRGECV + IRGESV) / IRWPI - (IRGECV(-1) + IRGESV(-1)) / IRWPI(-1))

As cited before, government investment and government expenditure in national accounting is different from government current expenditure in budget context. The equation here assumes government consumption as a function of current expenditure and special government expenditure which is deflated by wholesale price index.

703: Nonoil gross domestic product at market price at constant prices, billion Rials

IRGDPNF = B(7030) + B(7031) * IRK(-1) + B(7032) * (IRIP + IRIG - IRM * IRMACHIMV) + B(7033) * IREMP + B(7034) * IRM * IRMACHIMV + B(7035) * IRD79 + B(7036) * IRD8789

Theoretically, defining a production function at macro level has many problems, and we cannot apply micro production function at macro level. The production function with perfect substitutability of factors of production is very similar to national income from its total payment to factors of production point of view. So, we define here a production (Q) function (a and b are parameters) with perfect substitutability as follows:

Q = a.L + b.k

In this function, the isoquants are just downward slope straight lines in production factors space of capital (K) and labor (L). Since factors of production are perfect substitute, a firm that minimizes its expenditure will use that kind of production factor in which for each unit of product has a lower price. If it only uses labor, Q/a unit of labor employment is necessary for Q unit production. Subsequently, employment for each unit of production is equal to 1/a, and expenditure for each unit of production is equal to w/a, where w is wage rate. For capital, we can also say that if it only uses capital it need Q/b unit of capital for Q unit of production and expenditure for each unit of production is equal to r/b, in which r is the payment for each unit of capital as factor of production. Thus, the firm who minimizes expenditure will choose the cheapest combination of factors for production, so the cost function will be as:

$$C = \min\{\frac{w}{a}, \frac{r}{b}\}.Q$$

This cost function is constant return to scale. Thus, marginal cost is equal to average cost and they are constant. Because if we assume the factors prices as fixed we can write:

$$\frac{\partial C}{\partial Q} = \min\left(\frac{w}{a}, \frac{r}{b}\right) = \frac{C}{Q}$$

On the other side, properties of cost function derivatives that relates factor demands functions at fixed levels of production to cost function derivative to factor prices is satisfied in this functional form. This property is the same Shephard's Lemma in duality. Therefore, with the assumption of constant technology if the firm only uses labor then we would have:

$$\frac{\partial C}{\partial w} = \frac{Q}{a} = \frac{\partial Q}{\partial a} = L$$

and for capital we have:

$$\frac{\partial C}{\partial r} = \frac{Q}{b} = \frac{\partial Q}{\partial b} = K$$

In this case, it is obvious that minimum cost of production at a specific level of production will increase due to factor price increase equal to factor of production quantity multiplied by its price change.

Now, we write production function from national accounting point of view:

Q = w.L + r.K

The cost function in this case is as follows:

$$C = \min(\frac{w}{w}, \frac{r}{r}).Q = \min(1,1).Q = Q$$

Thus, total payment to factors of production is equal to total value of production and is equal to total expenditure. In other words, in this definition of production function, if we only use labor, we need Q/w unit of labor for Q unit of production and employment in each unit of production is equal to 1/w and cost of each unit of production is equal to (w/w)=1. This means that value added is equal to payment to factors of production which is true at macro level. Also, if we use only capital we need only Q/w units of capital for Q unit production and cost of each unit of production is equal to r/r or one. The Shephard's Lemma emphasis on this kind of production function is consistent at macro level; in other words:

$$\frac{\partial C}{\partial w} = \frac{\partial Q}{\partial w} = L$$

$$\frac{\partial C}{\partial r} = \frac{\partial Q}{\partial b} = K$$

In the above equations it can be seen that minimum cost of production with increase in factor price will increase and is equal to the amount of factor multiplied by its price change. In other words (*d* stands for differentiation):

*d*C = L . *d*w = *d*Q

dC = K. *d*r = *d*Q

This expression is exactly the same as the meaning of value added in national accounting. Since cost variation is equal to the variation of value added and is equal to multiplication of payment change to production factor by the effects of change in factor price.

Equality of marginal cost and average cost is the other case for suitability of this production function for macroeconomic conditions; because,

$$\frac{\partial C}{\partial Q} = \min(\frac{w}{w}, \frac{r}{r}) = 1 = \frac{C}{Q}$$

In other words, marginal cost is equal to average cost and is equal to one.

So, as defined above, nonoil production function is specified as a linear function of labor and capital. By capital variable, there are a lot of considerations that we use some other variables instead that totally mean stock of capital. In other words, stock of capital is equal to stock of capital at previous year plus new investment in current year. Investment is also made from two parts of private and public. So, in this equation instead of capital stock we enter three variables of capital stock in previous year and private and government investments for current year. Each of these variables has different coefficient in the production function, because each of them has different productivity. The productivity of capital stock has different productivity in comparison to current period's investment. Moreover, productivity of private investment is higher than public.

Regarding that the share of imports of machineries and capital equipment from total import of goods has noticeable effects on gross nonoil domestic products; we added the share of imports of machineries and equipment in this equation. This variable shows the effect of import of machineries and equipment in fixed capital formation and was entered as a factor in this equation. At first, the effect of this variable is omitted from investment and then was entered separately to show the productivity effect clearly.

704: Import of goods at constant prices, billion Rials

IRMG = IRMG(-1) + B(7041) * (IRMGDCIFP - IRMGDCIFP(-1))

This equation connects import of goods at constant Rial prices in national accounting to import of goods in balance of payments. The left hand side of this equation is total Rial value of total import of goods at constant prices, and its right hand side is a linear function of real imported goods in dollar value. Nominal dollar value of import is converted to real dollar value at constant prices by CIF price index.

705: Import of nonfactor services at constant prices, billion Rials

IRMNFS = B(7051) * (IRMNFSDCIFP - IRMNFSDCIFP(-1)) + B(7052) * IRMNFS(-1)

This equation is a connection between nonfactor income services at constant Rial prices in national accounts with import of nonfactor income services in balance of payments. The left hand side of this equation shows total import of nonfactor services in Rial at constant prices and the right hand side is a linear function of imported goods in dollar which was converted to constant prices with import CIF price index. In fact, this equation is a third type bridge regression to verify the identity.

706: Private investment at constant prices, billion Rials

IRIP = B(7060) + B(7061) * IRGDPNF(-1) + B(7062) * IRM * IRMACHIMV + B(7063) * IRIRL + B(7064) * IRD7779

This equation is investment demand. The right hand side variables are gross nonoil domestic products at constant prices, banking loans weighted interest rate and the share of imported machinery and equipment in fixed capital formation which is shown by multiplication of this variable by import of goods. In the case of omitting the import of machinery and equipment as capital goods, the investment equation will only be affected by nonoil gross domestic product and loan interest rate; without being affected by import of goods policies.

707: Value added of oil at constant prices, billion Rials

IRVAOIL = B(7071) * IRVAOIL(-1) + B(7072) * (IRXOILB - IRXOILB(-1)) + B(7073) * ((IRYOILB - IRXOILB) - (IRYOILB(-1) - IRXOILB(-1))) + B(7074) * IRD02

This equation gives the Rial value added of oil sector at constant prices by applying oil production in barrels. In this equation, production of oil is divided into two parts; one is export of oil, and the other part is difference of oil production and oil export which is approximately equals to domestic consumption. Export and domestic consumption are separately appeared in right hand side of the equation. Considering the fact that we do not have accurate gas and other oil products imports series; so instead of domestic consumption we only show the difference between the effects of these variables through the estimated coefficients. But, their effects will not be clear as a whole. This problem would be more serious about the value of gas effect. So, we applied some dummy variable instead. In the next versions of the model we will try to separate the effects of export and consumption of gas.

708: Capital consumption allowances at constant prices, billion Rials

IRCCA = B(7080) + B(7081) * (1 + B(7082) * IRD9408) * IRK(-1) + B(7083) * (IRWARCD + IRWARED + IRWARMD) + B(7084)* IRD9408

By definition in national accounting, depreciation or consumption of fixed capital is equal to replacement cost of capital consumption allowances. The losses resulted from un-expectable events like, war, earthquake or similar should not be considered in estimating fixed capital consumption allowances. Also, depletion of national resources e.g. forests, oil and mines are not considered in depreciation. There are different methods for estimating depreciation in national accounting. One of them which is used in Iran is Perpetual Inventory Method (PIM) suggested by United Nation System of National Accounts (SNA). This method assumes that total annual present value of depreciation of a capital good for its life should be equal to the purchasing value of that good. The details of this method are defined in SNA documents. According to this method, in Iran, capital investment machineries are defined in one group and construction capital formation is classified into three groups. So, the fixed capital formation consumption is neither a multiplication of capital stock nor the total output value. As a result, we cannot estimate capital depreciation with considering just a fixed rate of real capital consumption allowances. Here, we assumed that depreciation is a function of capital stock with one period time lag and the damages and losses from the Iran-Iraq war.

709: Private consumption at constant prices, billion Rials

IRC = B(7091) * (IRYD - IRYD(-1)) + B(7092) * IRSP(-1) + IRC(-1)

Here, we applied Kaldor and Friedman theories of consumption. According to Kaldor theory, consumption is a function of labor income Y(L) and wealth income Y(W). That is:

C= f [Y(W), Y(L)]

If we also apply some kind of difference of the above function, we can also add Friedman's permanent and transitory concepts incomes and consumptions:

$$\Delta C = f(\Delta Y(W), \Delta Y(L))$$

Here, instead of showing the wealth effect we applied the wealth change which would be assumed as saving. Income change is also regarded as effects of income increments.

710: Export of factor income from abroad at constant prices, billion Rials

IRXFY = IRXFY(-1) + B(7101) * (IRXFYSD / OECDP - IRXFYSD(-1) / OECDP(-1)) + B(7102) * IRD7879

Here, export of factor income from abroad (in dollar) in balance of payments account is converted to Rial receipts in national accounts. Since we have exchange rates variety in Iran and because of errors and discrepancies in balance of payments we applied the third method for verifying identities. In the right hand side of this equation, we applied the factor income receipts in dollar which was converted to real value by consumer price index of industrial countries.

711: Import of factor income from abroad at constant prices, billion Rials

IRMFY = IRMFY(-1) + B(7111) * (IRMFYSD / OECDP - IRMFYSD(-1) / OECDP(-1)) + B(7112) * IRD7377

Here, the dollar payments to factor income from abroad at constant prices in dollar (deflated by OECD price index) is linked to similar related item in national accounts.

712: Oil export at constant prices, billion Rials

IRXOIL = IRXOIL(-1) + B(7122) * (IRXOILB - IRXOILB(-1)) + B(7123) * IRD73 + B(7124) * IRD83

The oil export in terms of barrels of oil export is converted to Rial value of oil export at constant prices.

713: Export of goods at constant prices, billion Rials

IRXNOILG = IRXNOILG(-1) + B(7131) * (IRXGNODOP - IRXGNODOP(-1))

This equation is a relation between real exports of nonoil goods dollar value to nonoil exports in national accounts at constant prices.

714: Export of nonfactor services at constant prices, billion Rials

IRXNFS = IRXNFS(-1) + B(7141) * (IRXNFSDOP - IRXNFSDOP(-1))

This equation asserts the export of nonfactor services in national accounts at constant prices. Export of nonfactor services from abroad at constant prices is derived by dividing dollar value of export of nonfactor services from abroad by consumer price index in OECD countries. This equation in fact relates dollar value of nonfactor services from abroad in balance of payments to export of nonfactor services in national income at constant prices. If we omit this equation, the systematic relationship of balance of payments and export of nonfactor services from abroad in national accounting will be broken.

715: Input of production at constant prices, billion Rials

IRINPUT = IRINPUT(-1) + B(7151) * (IRGDPF - IRGDPF(-1)) + B(7152) * IRD79

This equation estimates value of intermediate inputs. The ratio of intermediate input to production is stable and will change with technology and production environment changes, so it will not fluctuate simply.

716: Change in inventory at constant prices, billion Rials

IRII = B(7160) + B(7161) * (IRII(-1) / IROUTPUT(-1)) * (IROUTPUT - IROUTPUT(-1)) + B(7162) * IRII(-1) + B(7163) * IRYEAR + B(7164) * IRPGDPF + B(7165) * (IRD8285 + IRD9394 + IRD73)

Change in inventory is defined as a function of the ratio of lag of this variable to total output with one year time lag multiplied by changes in total output of current year. It also considers time trend and price index of gross domestic product at factor cost.

2-6-5- Nominal Sector Identities and Equations

801: Aggregate demand at current prices, billion Rials

IRADV = IRINPUTV + IRCV + IRGV + IRIV + IRDISV + IRXV

Aggregate demand at current prices is sum of intermediate inputs, consumption, government expenditure, investment expenditure, statistical discrepancies and exports.

802: Aggregate supply at current prices, billion Rials

IRASV = IROUTPUTV + IRNITV + IRMV

Aggregate supply is sum of total output, net indirect taxes and current imports.

803: Aggregate output at current prices, billion Rials

IROUTPUTV = IRINPUTV + IRGDPFV

Current aggregate output is sum of current gross domestic product at factor cost and current intermediate inputs.

804: Aggregate input at current prices, billion Rials

IRINPUTV = IRPINPUT * IRINPUT

This equation gives intermediate inputs value and is derived from multiplication of intermediate input value at constant prices by intermediate input implicit price deflator.

805: Gross national saving at current prices, billion Rials

IRGNSV = IRIV + IRIIV + IRBOTV + IRNFYV

Gross national saving by definition in national accounting is sum of investment, change in inventory, trade balance and net factor income from abroad.

806: Net national saving at current prices, billion Rials

IRNNSV = IRGNSV - IRCCAV

Net national saving by definition is equal to gross national saving minus depreciation.

807: Export at current prices, billion Rials

IRXV = IRXOILV + IRXNOILGV + IRXNFSV

Export of goods and services in national accounts at current prices is equal to sum of export of goods, oil and nonfactor services from abroad. Factor income services from abroad is considered as export in balance of payments accounts and is considered in factor income services from abroad in national income account, so, it is not used here.

808: Import at current prices, billion Rials

IRMV = IRMGV + IRMNFSV

Import at current Rial prices is sum of import of goods and nonfactor income services.

809: Balance of trade at current prices, billion Rials

IRBOTV = IRXV - IRMV

Trade balance in national accounts is equal to net value of exports minus imports. It is worth mentioning that, this balance in definition is not the same as trade balance in balance of payments accounts. Net receipt of factor income services is also included in balance of payments accounts and is not entered in this account.

810: Gross domestic expenditure at market price at current prices, billion Rials

IRGDEMV = IRCV + IRGV + IRIV + IRBOTV + IRDISV

Gross domestic expenditure at market price is sum of private and public consumption and investment and trade balance plus change in inventory plus statistical discrepancies. Change of inventory is considered in statistical discrepancies.

811: Private saving at current prices, billion Rials

IRSPV = IRYDV - IRCV

Private sector's saving is derived from difference of current disposable income and current private consumption.

812: Capital stock at current prices, billion Rials

IRKV = IRKV(-1) * (1 + (IRPI - IRPI(-1)) / IRPI(-1)) + IRIV - IRCCAV

Nominal capital stock is derived from nominal capital stock in previous year inflated by investment price deflator and adding current investment and deducing current depreciation.

813: Gross domestic income at market price at current prices, billion Rials

IRGDIMV = IRGDPMV

Since terms of trade is a quantity with constant prices and is not defined at current prices, then current gross domestic income at market price is equal to current gross domestic product at market price.

814: Gross national income at market price at current prices, billion Rials

IRGNIMV = IRGNPMV

As terms of trade is not defined for current prices, gross national income at market price at current prices is exactly equal to current gross national product at market price.

815: Net national income at factor cost at current prices, billion Rials

IRNNIFV = IRGNIMV - IRCCAV - IRNITV

Net national income at factor cost at current prices is derived by deducting current depreciation and net indirect taxes from current gross national income at market price.

816: Nonoil gross domestic product at market price at current prices, billion Rials

IRGDPNFV = IRPGDPNF * IRGDPNF

Current nonoil gross domestic product at market price is equal to multiplication of this variable at constant prices by nonoil gross domestic product implicit deflator.

817: Gross national product at market price at current prices, billion Rials

IRGNPMV = IRGDPMV + IRNFYV

Current gross national product at market price is equal to sum of current gross domestic product at market price with current net factor income from abroad.

818: Gross domestic product at market price at current prices, billion Rials

IRGDPMV = IRGDPNFV + IRVAOILV + IRNITV

Current gross domestic product at market price is equal to current nonoil gross domestic product plus current value added of oil sector and current net indirect taxes. The reason for adding net indirect taxes to the right hand side of this equation is that the nonoil gross domestic product is at factor cost and the left hand side of the equation is at market price.

819: Disposable income at current prices, billion Rials

IRYDV = IRGDPNFV + IRNFYV - IRCCAV - IRGRTDV

Current disposable income is equal to nonoil gross domestic product at factor cost plus net factor income from abroad minus current direct taxes and current capital consumption allowances (depreciation). The reason that we do not subtract net indirect taxes from the right hand side is because the gross nonoil domestic product is at factor cost.

820: Capital consumption allowances at current prices, billion Rials

IRCCAV = IRCCA * IRPCCA

Capital consumption allowances at current prices is derived from the multiplication of capital consumption allowances at constant prices by implicit price deflator of capital consumption allowances.

821: Investment at current prices, billion Rials

IRIV = IRIGV + IRIPV

Total current investment is equal to private and public sector's investments at current prices.

822: Discrepancies at current prices, billion Rials

IRDISV = IRGDPMV - (IRCV + IRGV + IRIV + IRBOTV)

Current value of production-expenditure discrepancies is derived from deduction of expenditure components from gross domestic product at market price. In other words, current private consumption, current government expenditure, current investment and net current export are subtracted from current gross domestic product at market price. Change in inventory is included in statistical discrepancies variable.

823: Net indirect taxes at current prices, billion Rials

IRNITV = IRITV - IRSUBV

Net current indirect tax is derived from deduction of current indirect taxes from current subsidies.

824: Net factor income at current prices, billion Rials

IRNFYV = IRXFYV - IRMFYV

Net factor income from abroad is equal to the difference of current receipts and payments of factors income services from abroad.

825: Gross domestic product at factor cost at current prices, billion Rials

IRGDPFV = IRGDPNFV + IRVAOILV

Gross domestic product at factor cost is equal to sum of nonoil gross domestic product at factor cost and value added of oil sector.

901: Government consumption at current prices, billion Rials

IRGV = IRGV(-1) + B(9011) * ((IRGECV + IRGESV) - (IRGECV(-1) - (IRGESV(-1))))

As mentioned before, current government expenditures in national accounts is different from its government budget definition. This equation joins current government expenditure in national accounts to current special government expenditure in government budget. The cited regression connects these two accounts.

902: Government investment at current prices, billion Rials

IRIGV = IRIGV(-1) + B(9021) * (IRGEDV - IRGEDV(-1)) + B(9022) * (IRFEOAV - IRFEOAV(-1)) + B(9023) * IROLGV + B(9024) * IRD9497 + B(9025) * IRD02

This equation also connects national accounts and government budget in the investment sector. The current government investment by national accounts definition is a function of development and current expenditures of government. The allocated government funds to public sector by foreign exchange obligation account and government annual budget obligatory notes also enter in this equation.

903: Subsidies at current prices, billion Rials

IRSUBV = IRSUBV(-1) + B(9031) * (IRGECV + IRGESV - IRGECV(-1) - IRGESV)

Since the amount of subsidies is not cited clearly in government budget, we should estimate their amount from current and special expenditures of government. The current subsidy is a function of these variables.

904: Private consumption at current prices, billion Rials

IRCV = IRCV(-1) + B(9041) * (IRYDV - IRYDV(-1)) + B(9042) * IRSPV(-1)

Change in current private consumption is a function of change of current disposable income and current private saving in previous year.

905: Value added of oil sector at current prices, billion Rials

IRVAOILV = IRVAOILV(-1) + B(9051) * (IRXOILD / 1000 * IREO - IRXOILD(-1) / 1000 * IREO(-1)) + B(9052) * (IRPDOIL * (IRYOILB - IRXOILB) - IRPDOIL(-1) * (IRYOILB(-1) - IRXOILB(-1)))

Total value added of oil sector at current prices is derived through a regression equation and is equal to multiplication of oil export dollar value by official exchange rate and price index of domestic oil products by domestic oil consumption. The lagged dependent variable is to assert the stability of previous trend and corrects instability in time series of value added of the oil sector.

906: Import of goods at current prices, billion Rials

IRMGV = IRMGV(-1) + B(9061) * (IRMGD * IREENOIL - IRMGD(-1) * IREENOIL(-1))

Converting dollar value of imports to Rial value can be done by considering effective foreign exchange rate. For converting these figures the third method for verifying identities was used. If balance of payments accounts had consolidated connections with national accounts of Iran, this relation should be defined as an identity. During the sample period by using an add factor this equation is changed to an identity. But, for out of sample period for prediction the add factor would set to zero. Here, we applied the fourth method of verifying identities.

907: Import of nonfactor services at current prices, billion Rials

IRMNFSV = IRMNFSV(-1) + B(9071) * (IRMNFSD * IREENOIL - IRMNFSD(-1) * IREENOIL(-1))

Import of nonfactor services multiplied by effective exchange rate is converted from dollar to Rial. If balance of payments accounts had consolidated connections with national accounts of Iran, this relation should be defined as an identity. During the sample period by using an add factor this equation is changed to an identity. But, for out of sample period for prediction the add factor would set to zero. Here, we applied the fourth method of verifying identities.

908: Export of factor income from abroad at current prices, billion Rials

IRXFYV = IRXFYV(-1) + B(9081) * (IRXFYSD * IREENOIL - IRXFYSD(-1) * IREENOIL(-1))

Factor income services receipts from abroad at current prices is also converted by effective exchange rate through a regression considering the fourth method of verifying identities. If balance of payments accounts had consolidated connections with national accounts of Iran, this relation should be defined as an identity. During the sample period by using an add factor this equation it is changed to an identity. But, for out of the sample period for prediction the add factor would have a zero value.

909: Import of factor income from abroad at current prices, billion Rials

IRMFYV = IRMFYV(-1) + B(9090) + B(9091) * (IRMFYSD * IREENOIL - IRMFYSD(-1) * IREENOIL(-1)) + B(9092) * IRD93 + B(9093) * IRD5992

Import of factor income services multiplied by effective exchange rate is converted from dollar to Rial. If balance of payments accounts had consolidated connections with national accounts of Iran, this relation should be defined as an identity. During the sample period by using an add factor this equation it is changed to an identity. But, for out of sample for prediction the add factor would have a zero value. That is, we applied the fourth method of verifying identities.

910: Indirect taxes at current prices, billion Rials

IRITV = IRITV(-1) + B(9101) * (IRGRTIV - IRGRTIV(-1))

Indirect tax at current prices in national accounts is defined as a function of indirect taxes in government budget.

911: Private investment at current prices, billion Rials

IRIPV = IRIPV(-1) + IROLPV + B(9111) * (IRIRL - IRIRL(-1)) + B(9112) * (IRIRNB - IRIRNB(-1)) + B(9113) * (IROUTPUTV - IROUTPUTV(-1)) + B(9114) * IRD99 + B(9115) * IRD02

Private investment at current prices is defined as a function of banking and non-banking (non-organized) loan weighted interest rates and total current output. By entering government budget obligatory loans granted to private sector at right hand side of the equation, in fact, we subtract this variable from private investment in left hand side.

912: Oil export at current prices, billion Rials

IRXOILV = IRXOILV(-1) + B(9121)*(IRXOILD * IREO - IRXOILD(-1) * IREO(-1)) + B(9122) * IRD9900

If balance of payments accounts had consolidated connections with national accounts of Iran, this relation should be defined as an identity. During the sample period by using an add factor this equation is changed to an identity. But, for out of sample the add factor would have a zero value. Here, we applied the fourth method of verifying identities. Oil export at current Rial prices is derived by multiplication of oil export in dollar by official exchange rate.

913: Nonoil goods export at current prices, billion Rials

IRXNOILGV = B(9131) * (IRXGNOD * IREENOIL - IRXGNOD(-1) * IREENOIL(-1)) + IRXNOILGV(-1)

Nonoil export at current Rial prices is derived by multiplication of nonoil exports in dollar by effective exchange rate. Here again, we applied the fourth method of verifying identities.

914: Nonfactor services export at current prices, billion Rials

IRXNFSV = IRXNFSV(-1) + B(9141) * (IRXNFSD * IREENOIL - IRXNFSD(-1) * IREENOIL(-1))

Nonfactor services receipts from abroad at current prices is also converted by effective exchange rate through a regression considering the fourth method of verifying identities. If balance of payments accounts had consolidated connections with national accounts of Iran, this relation should be defined as an identity. Here, we applied the fourth method of verifying identities.

915: Change in inventory at current prices, billion Rials

IRIIV = IRIIV(-1) + B(9151) * (IRIIV(-1) / IRINPUTV(-1)) * (IRINPUTV - IRINPUTV(-1)) + B(9152) * (IRIIV(-1) / IRGDPFV(-1)) * (IRGDPFV - IRGDPFV(-1)) + B(9153) * IRD00 + B(9154) * IRD95 + B(9156) *IRD03

Change in inventory at current prices is derived according to the ratio of change in inventory to change in total output in last year multiplied by change in current intermediate input; and ratio of change in inventory to change in gross domestic product at factor cost at current prices in last year multiplied by change in gross domestic product at factor cost at current prices.

2-6-6- Price Identities and Equations

1001: Implicit price deflator corresponding aggregate demand and supply

IRPA = IRADV / IRAS

Aggregate supply/demand price deflator is derived from dividing aggregate demand at current prices to aggregate supply at constant prices.

1002: Gross domestic product at factor cost implicit price deflator

IRPGDPF = IRGDPFV / IRGDPF

Price deflator of gross domestic product at factor cost is derived from the current price value to constant prices value of gross domestic product at factor cost.

1003: Gross national saving implicit price deflator

IRPGNS = IRGNSV / IRGNS

Price deflator of gross national saving is derived from dividing the current amount to the constant prices of this variable.

1004: Net national saving implicit price deflator

IRPNNS = IRNNSV / IRNNS

This price deflator is derived from current to constant prices net national saving.

1005: Import of goods implicit price deflator

IRPMG = IRMGV / IRMG

This deflator is derived from dividing current imports value in Rial to its constant value.

1006: Import of nonfactor services implicit price deflator

IRPMNFS = IRMNFSV / IRMNFS

This deflator is derived from dividing current import of nonfactor services in Rial to its constant prices.

1007: Export of oil implicit price deflator

IRPXOIL = IRXOILV / IRXOIL

Oil export price deflator is derived from dividing this variable at current Rial value to its value at constant prices.

1008: Export of nonoil goods implicit price deflator

IRPXNOILG = IRXNOILGV / IRXNOILG

Export of nonoil goods implicit price deflator is derived from current value to constant prices value.

1009: Export of nonfactor services implicit price deflator

IRPXNFS = IRXNFSV / IRXNFS

This variable is calculated by dividing its current Rial value to constant prices Rial value.

1010: Balance of trade implicit price deflator

IRPBOT = IRBOTV / IRBOT

This variable is calculated by dividing its current value to constant prices value.

1011: Gross domestic expenditure at market price implicit price deflator

IRPGDEM = IRGDEMV / IRGDEM

Price deflator of gross domestic expenditures at market price is calculated by dividing the current value to constant prices value.

1012: Private saving implicit price deflator

IRPSP = IRSPV / IRSP

This variable is calculated by dividing the current value of private saving to constant prices value of this variable.

1013: Capital stock implicit price deflator

IRPK = IRKV / IRK

This variable is calculated by dividing current value to constant prices variables.

1014: Gross domestic product implicit price deflator

IRPGDPM = IRGDPMV / IRGDPM

Price deflator of gross domestic product at market price is derived from dividing the current value to its constant prices value.

1015: Private consumption implicit price deflator

IRPC = IRCV / IRC

This variable is derived from dividing the current value of private consumption to its constant prices value.

1016: Government investment implicit price deflator

IRPIG = IRIGV / IRIG

Public investment price deflator is derived from dividing the current value to its constant prices value.

1017: Private investment implicit price deflator

IRPIP = IRIPV / IRIP

This variable is derived from dividing the current value of this variable to its constant prices value.

1018: Government consumption implicit price deflator

IRPG = IRGV / IRG

This variable is derived from dividing the current value of this variable to its constant prices value.

1019: Net indirect taxes implicit price deflator

IRPNIT = IRNITV / IRNIT

This variable is derived from dividing the current value of this variable to its constant prices value.

1020: Import implicit price deflator

IRPM = IRMV / IRM

This variable is derived from dividing the current value of this variable to its constant prices value.

1021: Export implicit price deflator

IRPX = IRXV / IRX

This variable is derived from dividing the current value of this variable to its constant prices value.

1022: Net factor income from abroad implicit price deflator

IRPNFY = IRNFYV / IRNFY

This variable is derived from dividing the current value of this variable to its constant prices value.

1023: Export of factor income from abroad implicit price deflator

IRPXFY = IRXFYV / IRXFY

This variable is derived from dividing the current value of this variable to its constant prices value.

1024: Import of factor income from abroad implicit price deflator

IRPMFY = IRMFYV / IRMFY

This variable is derived from dividing the current value of this variable to its constant prices value.

1025: Oil value added implicit price deflator

IRPVAOIL = IRVAOILV / IRVAOIL

This variable is derived from dividing the current value of this variable to its constant prices value.

1026: Investment implicit price deflator

IRPI = IRIV / IRI

This variable is derived from dividing the current value of this variable to its constant prices value.

1027: Inflation rate, consumer price index

IRINFCPI = (IRCPI - IRCPI(-1)) / IRCPI(-1)

Inflation rate of consumer price index is defined as average change of consumer price index.

1028: Inflation rate, wholesale price index

IRINFWPI = (IRWPI - IRWPI(-1)) / IRWPI(-1)

Inflation rate of wholesale price index is defined as average change of wholesale price index.

1029: Gross national product implicit price deflator

IRPGNPM = IRGNPMV / IRGNPM

This variable is derived from division of the current value of this variable to its constant prices value.

1030: Discrepancies implicit price deflator

IRPDIS = IRDISV / IRDIS

This variable is derived from division of the current value of this variable to its constant prices. It is worth mentioning that the change in inventory is included in statistical discrepancies.

1031: Gross domestic income implicit price deflator

IRPGDIM = IRGDIMV / IRGDIM

This variable is derived from the ratio of gross domestic income at current prices to gross domestic income at constant prices.

1032: Gross national income implicit price deflator

IRPGNIM = IRGNIMV / IRGNIM

Gross national income implicit price deflator is derived from dividing its market price value to constant prices value.

1033: Disposable income implicit price deflator

IRPYD = IRYDV / IRYD

This variable is derived from dividing the current value of this variable to its constant prices value.

1034: Net national income implicit price deflator

IRPNNIF = IRNNIFV / IRNNIF

This variable is derived from dividing the current value of this variable to its constant prices value.

1035: Nonoil gross domestic product implicit price deflator

IRPGDPNF = (IRCV + IRGV + IRIV + IRXV - IRMV + IRDISV - IRVAOILV - IRNITV) / IRGDPNF

This variable is derived from gross domestic expenditure (minus some variables) at current prices divided by gross nonoil domestic product at factor cost at constant prices. The gross domestic expenditures at current prices is equal to sum of private and government consumption and investment at current price, change in inventory, net current export and statistical discrepancies at current prices. Value added of oil at current prices is subtracted from gross domestic expenditures at current prices. The reason for deducting net indirect taxes from the right hand side of the equation is because that gross domestic nonoil product value is calculated at factor cost.

This equation is very important in solving the model and if the position of this equation in whole system be changed the solution of the model might be fall in trouble. For this reason, IRGDEM was not replaced by components of gross domestic expenditures. This is also the case for replacement of export minus import instead of IRBOTV.

1036: Indirect taxes implicit price deflator

IRPIT = IRPGDPF

The indirect tax deflator is equal to gross domestic price deflator at factor cost as defined by national accounting.

1037: Subsidies implicit price deflator

IRPSUB = IRPGDPF

The subsidy price deflator is equal to gross domestic price deflator at factor cost as defined by national accounting.

1038: Output implicit price deflator

IRPOUTPUT = IROUTPUTV / IROUTPUT

This variable is derived from dividing its current value to constant prices value.

1039: Change in inventory implicit price deflator

IRPII = IRIIV / IRII

This variable is derived from dividing change in inventory at current prices to its value at constant prices. This method has some conceptual difficulties in definition; because this variable changes dynamically and is based on two years values and should not be derived with a static ratio just for the current year.

2001: Market exchange rate, Rials / Dollar

IREM = IREM(-1) + B(20011) * (IRM2V - IRM2V(-1)) + B(20012) * IRBOPD + B(20013) * IRGRDSV + B(20014) * IRD99 + B(20015) * IRD0208

Change in dollar exchange rate in nonofficial market is defined as a function of three variables, supply of domestic money, balance of payments and amount of selling foreign exchange in nonofficial market. As a result, the coefficient of change in supply of domestic money should be positive. The coefficient of balance of payment should be negative in relation to changes in supply of foreign money. Balance of payments after converting to Rial would be equal to change in net foreign assets of central bank. The coefficient of selling foreign exchange in nonofficial market should be negative. Selling foreign exchange in nonofficial market by government will decrease domestic money and increase supply of foreign currency in the market, which appreciate national currency.

2002: Effective exchange rate for nonoil goods and services, Rials / Dollar

IREENOIL = IREO * IRD5978 + (1 - IRD5978) * ((B(20020) + B(20021) * IREM + (1 - B(20021)) * IREO) + B(20022) * IREENOIL(-1) + B(20023) * IRD9308

Until the year 1978, the effective exchange rate of dollar was equal to its official exchange rate. After the 1979 revolution, it is defined as average value of dollar value in official and nonofficial markets. The model's coefficients are restricted in such a way that sum of the values of these two coefficients is equal to one.

2003: Wholesale price index for imported goods

IRWPIM = IRWPIM(-1) + B(20031) * (((IRMGD / (IRMGD + IRMNFSD)) * IRPM) - ((IRMGD(-1) / (IRMGD(-1) + IRMNFSD(-1))) * IRPM(-1)))

This index is a function of import price implicit deflator and this recent deflator contains prices of all goods and services, for omitting the effect of services from this variable, this index is multiplied by the share of imported goods to import of all imported goods and services plus nonfactor income services import from abroad; because, the wholesale price index of imported goods only includes the goods. The one period lag variable is brought on two side of the equation for omitting the non-stationary effect.

2004: Wholesale price index for exported goods

IRWPIX = IRWPIX(-1) + B(20041) * (((IRXGNOD / (IRXGD + IRXNFSD)) * IRPX) - ((IRXGNOD(-1) / (IRXGD(-1) + IRXNFSD(-1))) * IRPX(-1)))

Wholesale price index for exported goods includes export of nonoil goods. So, for calculating this index, by a regression we relate this variable to nonoil ratio of nonoil export to whole export of goods and nonfactor services multiplied by the price deflator of total export. The first differences in both sides of the equation are for omitting non-stationary effect.

2005: Wholesale price index for domestically produced and consumed goods

IRWPID = IRWPID(-1) + B(20051) * (IRPGDPNF - IRPGDPNF(-1))

This variable is a function of nonoil GDP at factor cost implicit price deflator. The variables with one period time lag are for omitting non-stationary effect.

2006: Wholesale price index

IRWPI = B(20061) * IRWPID + B(20062) * IRWPIM + (1 - B(20061) - B(20062)) * IRWPIX

This variable appears as a weighted average of three indexes of wholesale price indices of imported goods, exported goods and domestically produced and consumed goods. Sum of the coefficients are restricted to become one. During the sampling period with adding the add factor this equation will become an identity but out of the sample period for prediction the add factor will be set to zero.

2007: Consumer price index

IRCPI = IRCPI(-1) + B(20071) * (IRPGDPNF - IRPGDPNF(-1)) + B(20072) * IRD00

This variable is obtained through a regression on GDP at factor cost implicit price deflator.

2008: Non-organized market interest rate

IRIRNB = B(20080) + B(20081) * IRIRNB(-1) + B(20082) * (IRSPV - IRSPV(-1)) + (IRCPI - IRCPI(-1)) / IRCPI(-1) + B(20083) * IRD7908 + B(20084) * IRD9699

This equation asserts the money supply of private sector in an inverse form and with considering the interest rate of non-organized money market appearing in the left hand side of the equation. The non-organized money market's interest rate is defined as a function of current private saving. Inflation rate is a complementary variable in this function.

2009: Capital consumption allowances implicit price deflator

IRPCCA = IRPCCA(-1) + B(20091) * (IRPK - IRPK(-1))

National accounting defines the price deflator of fixed capital depreciation equal to the total investment implicit price deflator. But, here for more accuracy we relate the price index with the price index of capital stock.

2010: Input implicit price deflator

IRPINPUT = IRPINPUT(-1) + B(20101) * (IRPGDPF - IRPGDPF(-1))

In national accounting, total input price deflator is considered the same as GDP deflator at factor cost. For more accuracy we write the input price deflator as a function of GDP price deflator at factor cost.

2-6-7- Labor Market Identities and Equations

3001: Wage index

IRWIND = IRWINDPGDPM * IRPGDPM

Wage index is defined as multiplication of real wage to GDP implicit price deflator at market price.

3002: Active population, thousands

IRPOPA = IRPOPAPOP * IRPOP

This variable is equal to the ratio of active population to total population. For more accuracy we considered this variable as an endogenous variable.

3003: Unemployment, thousands

IRUNEMP = IRPOPA - IREMP

Unemployment is derived from difference of active population and occupied (employed) population.

3004: Unemployment rate, percent

IRUNEMPR = IRUNEMP / IRPOPA * 100

Unemployment rate is derived from the ratio of number of unemployed population over active population multiplied by 100.

3101: Active population ratio

IRPOPAPOP = B(31010) + B(31011) * IRPOPAPOP(-1) + B(31012) * IRYEAR + B(31012) * IRD66

Ratio of active population to total population is a function of its previous value and time trend.

3102: Population, thousands

IRPOP = B(31020) + B(31021) * IRPOP(-1)

Total population in each year is regressed to its lagged variable.

3103: Real wage index

IRWINDPGDPM = IRWINDPGDPM(-1) + B(31031) * (IREMP - IREMP(-1)) + B(31032) * (IRGDPM - IRGDPM(-1)) + B(31033) * IRD7579 + B(31034) * IRD7880

This equation is principally demand for labor. The left hand side is the wage index of industrial manufactories which by applying GDP deflator at market price changed to real wage index. In the right hand side, employment, gross domestic product at market price and lagged real wage index were used. Since the demand for labor has an inverse relationship to real wage; so we expect a negative coefficient for employment.

3104: Employment, thousands

IREMP = IREMP(-1) + B(31041) * (IRWIND - IRWIND(-1)) + B(31042) * IRPOPA + B(31043) * IRD66 + B(31044) * IRD76

This equation is supply of labor. Here, supply of labor is a function of nominal wage rate of industrial manufactories and active population. The estimated coefficient for these two variables should be positive.

Chapter Three

Estimation of the Model

3-1 Model Estimation

Following table shows the results of estimation.

System: VER6_SYS_200_EQ

Estimation Method: Iterative Least Squares

Date: 10/27/04 Time: 12:43

Sample: 1959 2003,

Included observations: 45

Total system (unbalanced) observations 2864

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
B(1011)	0.938220	0.028509	32.90922	0.0000
B(1021)	0.000683	0.000106	6.463399	0.0000
B(1022)	5.17E-05	2.23E-05	2.316238	0.0206
B(1023)	-15.66976	1.428785	-10.96719	0.0000
B(1030)	-3.053998	0.640698	-4.766677	0.0000
B(1031)	-0.002714	0.001327	-2.044434	0.0410
B(1032)	0.000350	3.93E-05	8.899743	0.0000
B(1033)	18.25077	1.906234	9.574256	0.0000

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
B(1040)	16.51102	9.812815	1.682597	0.0926
B(1041)	0.007587	0.000695	10.91703	0.0000
B(1042)	-0.015600	0.002221	-7.024852	0.0000
B(1043)	0.000409	0.000111	3.681017	0.0002
B(1044)	-0.807827	0.132908	-6.078088	0.0000
B(1045)	0.006168	0.001035	5.959242	0.0000
B(1046)	-82.09988	20.79628	-3.947817	0.0001
B(1050)	-4.955529	1.707294	-2.902564	0.0037
B(1051)	0.001847	0.000539	3.428631	0.0006
B(1052)	0.791900	0.089987	8.800150	0.0000
B(1053)	2.49E-05	1.28E-05	1.941892	0.0523
B(1060)	1768.130	218.4329	8.094611	0.0000
B(1061)	2.620961	0.591710	4.429469	0.0000
B(1062)	-2.240442	0.600354	-3.731867	0.0002
B(1063)	0.220232	0.070848	3.108487	0.0019
B(1064)	0.259733	0.027441	9.465293	0.0000
B(1065)	-1852.226	236.9079	-7.818336	0.0000
B(1066)	2379.013	308.8867	7.701895	0.0000
B(1070)	93.46472	63.55033	1.470720	0.1415
B(1071)	0.241706	0.031465	7.681828	0.0000
B(1072)	-1629.943	194.1665	-8.394564	0.0000
B(1073)	0.543661	0.065315	8.323647	0.0000
B(1074)	884.2307	152.0219	5.816471	0.0000
B(1081)	-0.129446	0.036481	-3.548318	0.0004
B(1082)	-0.214695	0.022534	-9.527470	0.0000
B(1083)	-0.090988	0.064386	-1.413172	0.1577
B(1084)	-0.077253	0.025184	-3.067585	0.0022
B(1085)	-4408.562	701.9070	-6.280834	0.0000

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
B(1086)	-2495.118	527.3125	-4.731764	0.0000
B(1090)	3967.793	208.3527	19.04363	0.0000
B(1091)	0.040286	0.015122	2.664024	0.0078
B(1092)	0.028933	0.011603	2.493640	0.0127
B(1093)	0.135731	0.060752	2.234173	0.0256
B(1094)	0.078389	0.032400	2.419389	0.0156
B(1095)	-0.099920	0.035707	-2.798371	0.0052
B(1096)	-0.999548	0.005804	-172.2151	0.0000
B(1097)	-1268.860	132.3117	-9.589933	0.0000
B(1098)	659.8853	137.1007	4.813142	0.0000
B(3011)	283.7412	104.7038	2.709942	0.0068
B(3012)	15796.21	5604.450	2.818512	0.0049
B(3020)	-8231.793	1990.450	-4.135645	0.0000
B(3021)	0.972871	0.026943	36.10824	0.0000
B(3022)	902.1258	210.4718	4.286207	0.0000
B(3023)	-17383.14	2552.939	-6.809068	0.0000
B(3024)	0.203182	0.040236	5.049744	0.0000
B(3025)	-28307.40	4317.386	-6.556607	0.0000
B(3031)	0.462007	0.062545	7.386744	0.0000
B(3032)	0.527280	0.068570	7.689661	0.0000
B(3033)	3703.509	884.1601	4.188731	0.0000
B(3034)	-3417.568	805.2976	-4.243857	0.0000
B(3041)	0.053394	0.013127	4.067409	0.0000
B(3042)	0.764757	0.053016	14.42507	0.0000
B(3043)	-1200.085	301.0781	-3.985958	0.0001
B(3044)	166.7775	48.19153	3.460722	0.0005
B(3050)	5025.716	2701.864	1.860092	0.0630
B(3051)	0.142900	0.024763	5.770804	0.0000

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
B(3052)	-2611.820	708.8954	-3.684352	0.0002
B(3053)	0.734614	0.055763	13.17384	0.0000
B(3060)	22432.19	4874.868	4.601598	0.0000
B(3061)	0.652367	0.096816	6.738206	0.0000
B(3062)	0.042999	0.013201	3.257174	0.0011
B(3063)	-10777.39	2721.385	-3.960257	0.0001
B(3064)	-909.9584	293.5188	-3.100170	0.0020
B(3065)	-316.5136	79.15276	-3.998769	0.0001
B(3066)	-5943.097	3070.199	-1.935737	0.0530
B(5011)	0.084521	0.010693	7.904267	0.0000
B(5012)	0.062022	0.014810	4.187820	0.0000
B(5013)	-10574.57	770.7049	-13.72065	0.0000
B(5014)	9187.662	845.3833	10.86804	0.0000
B(5021)	0.503500	0.007866	64.01093	0.0000
B(5022)	0.131926	0.010511	12.55161	0.0000
B(5023)	0.794729	0.123601	6.429778	0.0000
B(5024)	-7967.086	1396.117	-5.706604	0.0000
B(5025)	10696.14	764.4136	13.99261	0.0000
B(5031)	0.099201	0.025541	3.883945	0.0001
B(5040)	0.027573	0.001332	20.69496	0.0000
B(5051)	0.017120	0.001265	13.53477	0.0000
B(7011)	61.94041	9.510108	6.513113	0.0000
B(7012)	18381.83	2718.127	6.762682	0.0000
B(7013)	-15923.26	3030.609	-5.254145	0.0000
B(7014)	26253.74	3224.967	8.140778	0.0000
B(7015)	-21355.61	2789.260	-7.656372	0.0000
B(7021)	16.80744	4.407601	3.813285	0.0001
B(7030)	-37400.25	4660.627	-8.024724	0.0000

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
B(7031)	0.068453	0.005795	11.81300	0.0000
B(7032)	0.885109	0.061272	14.44550	0.0000
B(7033)	9.216125	0.713384	12.91889	0.0000
B(7034)	0.251090	0.104137	2.411146	0.0160
B(7035)	23054.70	4405.671	5.232959	0.0000
B(7036)	-17816.29	2951.540	-6.036268	0.0000
B(7041)	372.4702	18.91275	19.69414	0.0000
B(7051)	343.9700	17.71250	19.41962	0.0000
B(7052)	0.964323	0.019718	48.90472	0.0000
B(7060)	12471.00	2399.541	5.197245	0.0000
B(7061)	0.202117	0.016929	11.93925	0.0000
B(7062)	1.735642	0.102105	16.99866	0.0000
B(7063)	-2298.971	366.7558	-6.268398	0.0000
B(7064)	-19862.51	3475.405	-5.715165	0.0000
B(7071)	0.995004	0.003334	298.4086	0.0000
B(7072)	40.89797	0.778274	52.54959	0.0000
B(7073)	7.749489	3.947542	1.963117	0.0497
B(7074)	4261.260	980.4222	4.346352	0.0000
B(7080)	5286.016	261.3786	20.22360	0.0000
B(7081)	0.035881	0.000465	77.14133	0.0000
B(7082)	-0.372030	0.073470	-5.063665	0.0000
B(7083)	0.015105	0.007309	2.066540	0.0389
B(7084)	14706.76	3315.921	4.435197	0.0000
B(7091)	0.329782	0.068604	4.807032	0.0000
B(7092)	0.101947	0.025481	4.000897	0.0001
B(7101)	244.4891	17.93685	13.63055	0.0000
B(7102)	-5058.133	752.5469	-6.721353	0.0000
B(7111)	165.2402	9.057111	18.24425	0.0000

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
B(7112)	2780.463	592.3333	4.694084	0.0000
B(7122)	39.27605	1.207021	32.53966	0.0000
B(7123)	-5884.918	1489.823	-3.950080	0.0001
B(7124)	4822.320	1466.674	3.287930	0.0010
B(7131)	472.4020	56.11807	8.418001	0.0000
B(7141)	174.2496	18.52433	9.406526	0.0000
B(7151)	0.481404	0.062449	7.708722	0.0000
B(7152)	-37556.92	6282.031	-5.978469	0.0000
B(7160)	-897246.9	198114.5	-4.528931	0.0000
B(7161)	1.914627	1.087203	1.761057	0.0783
B(7162)	0.333426	0.105385	3.163900	0.0016
B(7163)	668.9374	146.6390	4.561797	0.0000
B(7164)	-8342.252	2353.605	-3.544457	0.0004
B(7165)	-19719.73	3084.657	-6.392842	0.0000
B(9011)	0.152953	0.016519	9.259208	0.0000
B(9021)	0.841844	0.079124	10.63954	0.0000
B(9022)	0.451966	0.238926	1.891659	0.0586
B(9023)	0.675673	0.197714	3.417424	0.0006
B(9024)	-9016.327	2635.186	-3.421515	0.0006
B(9025)	27815.29	2086.890	13.32858	0.0000
B(9031)	0.050171	0.004135	12.13198	0.0000
B(9041)	0.368968	0.074864	4.928490	0.0000
B(9042)	0.357412	0.064054	5.579873	0.0000
B(9051)	0.712555	0.037794	18.85367	0.0000
B(9052)	0.402393	0.093915	4.284636	0.0000
B(9061)	0.001006	1.62E-05	62.20524	0.0000
B(9071)	0.000983	6.18E-06	159.0198	0.0000
B(9081)	0.001175	8.12E-05	14.48233	0.0000

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
B(9090)	-1210.964	228.9710	-5.288722	0.0000
B(9091)	0.001289	2.88E-05	44.70607	0.0000
B(9092)	2290.315	656.9352	3.486364	0.0005
B(9093)	1163.855	252.6611	4.606389	0.0000
B(9101)	0.423051	0.086618	4.884091	0.0000
B(9111)	-846.8540	358.2333	-2.363973	0.0182
B(9112)	-251.9120	76.27983	-3.302472	0.0010
B(9113)	0.121572	0.006926	17.55399	0.0000
B(9114)	-9378.276	2920.234	-3.211481	0.0013
B(9115)	-11455.46	3587.160	-3.193463	0.0014
B(9121)	0.000644	1.90E-05	33.88678	0.0000
B(9122)	25627.52	2123.704	12.06737	0.0000
B(9131)	0.000870	7.45E-05	11.68833	0.0000
B(9141)	0.000964	1.56E-05	61.62260	0.0000
B(9151)	-2.608662	0.877087	-2.974234	0.0030
B(9152)	3.118477	0.701138	4.447738	0.0000
B(9153)	30557.12	3608.947	8.467047	0.0000
B(9154)	14290.91	3596.447	3.973618	0.0001
B(9156)	33592.62	5669.609	5.925033	0.0000
B(20011)	0.054779	0.005375	10.19134	0.0000
B(20012)	-0.031967	0.016651	-1.919838	0.0550
B(20013)	-0.082960	0.009027	-9.190404	0.0000
B(20014)	1990.750	218.2428	9.121723	0.0000
B(20015)	-5344.133	570.5400	-9.366799	0.0000
B(20020)	-277.2563	65.58719	-4.227294	0.0000
B(20021)	0.601414	0.027469	21.89391	0.0000
B(20022)	0.191949	0.031479	6.097637	0.0000
B(20023)	-908.9763	152.1358	-5.974768	0.0000

Parameter	Coefficient	Std. Error	t-Statistic	Prob.
B(20031)	38.89449	5.789690	6.717889	0.0000
B(20041)	185.0860	38.59996	4.794979	0.0000
B(20051)	83.87346	3.423243	24.50117	0.0000
B(20061)	0.714236	0.007719	92.52816	0.0000
B(20062)	0.245999	0.005082	48.40871	0.0000
B(20071)	99.87955	1.678574	59.50261	0.0000
B(20072)	-13.49636	1.216681	-11.09276	0.0000
B(20080)	12.56823	2.192764	5.731686	0.0000
B(20081)	0.429251	0.093687	4.581756	0.0000
B(20082)	0.000428	8.10E-05	5.285063	0.0000
B(20083)	10.62016	2.037808	5.211560	0.0000
B(20084)	-6.866608	1.978940	-3.469841	0.0005
B(20091)	1.049817	0.027679	37.92868	0.0000
B(20101)	0.810103	0.035278	22.96372	0.0000
B(31010)	-0.335100	0.055638	-6.022873	0.0000
B(31011)	1.095081	0.029810	36.73529	0.0000
B(31012)	0.000227	3.77E-05	6.017742	0.0000
B(31020)	752.8582	165.3721	4.552511	0.0000
B(31021)	1.006568	0.003728	270.0304	0.0000
B(31031)	-0.010461	0.004510	-2.319360	0.0205
B(31032)	0.000389	0.000117	3.320492	0.0009
B(31033)	13.89373	4.240248	3.276631	0.0011
B(31034)	16.68294	6.279030	2.656930	0.0079
B(31041)	15.23181	2.612997	5.829251	0.0000
B(31042)	0.015383	0.002110	7.290295	0.0000
B(31043)	681.5547	126.1824	5.401346	0.0000
B(31044)	373.2981	126.6665	2.947093	0.0032

Determinant residual covariance	0.000000		

Equation: IRXOILB=IRXOILB(-1)+B(1011)*(IRYOILB-IRYOILB(-1))

Observations: 44

R-squared	0.993289	Mean dependent var	924.3946
Adjusted R-squared	0.993289	S.D. dependent var	449.0470
S.E. of regression	36.78490	Sum squared resid	58184.54
Durbin-Watson stat	2.109162		

Equation: IRXNFSDOP=IRXNFSDOP(-1)+B(1021)*IREENOIL +B(1022) *(IRGDPNF-IRGDPNF(-1))+B(1023)*IRD79

Observations: 44

R-squared	0.964866	Mean dependent var	5.041983
Adjusted R-squared	0.963152	S.D. dependent var	7.437831
S.E. of regression	1.427752	Sum squared resid	83.57751
Durbin-Watson stat	1.551213		

Equation: IRMNFSDCIFP= IRMNFSDCIFP(-1)+B(1030)+B(1031) *(IREENOIL*IRCIFP/IRWPI-IREENOIL(-1)*IRCIFP(-1)/IRWPI(-1)) +B(1032)*(IRGDPM-IRGDPM(-1)) +B(1033)*(IRD77+IRD79+IRD88+IRD02)

Observations: 44

R-squared	0.941003	Mean dependent var	14.22489
Adjusted R-squared	0.936578	S.D. dependent var	13.69391
S.E. of regression	3.448631	Sum squared resid	475.7221
Durbin-Watson stat	1.322466		

Equation: IRMGDCIFP=B(1040) +B(1041)*(IRXGD+IRXSD)+B(1042) *IREENOIL+B(1043)*IRGDPM+B(1044)*IRCIFP+B(1045)*IRKAD +B(1046)*IRD79

Observations: 45

R-squared	0.948305	Mean dependent var	126.4949
Adjusted R-squared	0.940142	S.D. dependent var	75.92342

S.E. of regression	18.57533	Sum squared resid	13111.63
Durbin-Watson stat	1.424502		

Equation: IRXGNODOP = B(1050)+B(1051)*IREX*OECDP/IRWPI +B(1052)*IRXGNODOP(-1)+B(1053)*IRGDPNF

Observations: 44

R-squared	0.928045	Mean dependent var	17.26075
Adjusted R-squared	0.922648	S.D. dependent var	14.77531
S.E. of regression	4.109345	Sum squared resid	675.4688
Durbin-Watson stat	1.708243		

Equation: IRMFYSD=B(1060)+(B(1061)+B(1062)*(1-IRD5977)) *IRKADC *LIBOR/100+B(1063)*IRMFYSD(-1) +B(1064)*IRD5978*IRMGD +B(1065)*IRD5977+B(1066)*IRD0208

Observations: 44

R-squared	0.927348	Mean dependent var	1617.873
Adjusted R-squared	0.915567	S.D. dependent var	1320.553
S.E. of regression	383.7184	Sum squared resid	5447874.
Durbin-Watson stat	1.791443		

Equation: IRXFYSD= B(1070)+B(1071)*IRGEFIDC+B(1072)*(1 -IRD5978)+B(1073)*IRXFYSD(-1)+B(1074)*IRD0108

Observations: 44

R-squared	0.938543	Mean dependent var	949.2086
Adjusted R-squared	0.932240	S.D. dependent var	928.7080
S.E. of regression	241.7498	Sum squared resid	2279276.
Durbin-Watson stat	2.746867		

Equation: IRBOPEODC =B(1081)*IRKADC+B(1082)*IRTBDC+B(1083) *IRFYSBDC +B(1084)*IRNFSBDC+B(1085)*IRD84+B(1086)*IRD9495

Observations: 45

R-squared	0.980722	Mean dependent var	-5610.767

Adjusted R-squared	0.978250	S.D. dependent var	4478.980
S.E. of regression	660.5513	Sum squared resid	17016793
Durbin-Watson stat	1.687301		

Equation: IRNTRDC =IRNTRDC(-1)+(B(1090)+B(1091)*IRKADC +B(1092)*IRTBDC+B(1093)*IRFYSBDC+B(1094)*IRNFSBDC +B(1095)*IRBOPEODC)*(1+B(1096)*IRD5988)+B(1097)*IRD95 +B(1098)*IRD92

Observations: 44

R-squared	0.999694	Mean dependent var	3978.714
Adjusted R-squared	0.999624	S.D. dependent var	5875.776
S.E. of regression	113.8773	Sum squared resid	453881.0
Durbin-Watson stat	2.015581		

Equation: IRM2NPVPGDPM=IRM2NPVPGDPM(-1)+B(3011)*IRIRL +B(3012)*IRD7576

Observations: 44

R-squared	0.949721	Mean dependent var	64883.88
Adjusted R-squared	0.948523	S.D. dependent var	34175.88
S.E. of regression	7753.973	Sum squared resid	2.53E+09
Durbin-Watson stat	1.253268		

Equation: IRM2NGSVPGDPM = B(3020)+ B(3021)*IRM2NGSVPGDPM(-1)+B(3022)* IRIRL+B(3023) *IRD9497+B(3024)*IRD5978*IRM2NGSVPGDPM(-1) +B(3025)*IRD0308

Observations: 44

R-squared	0.977026	Mean dependent var	-41229.48
Adjusted R-squared	0.974003	S.D. dependent var	25006.88
S.E. of regression	4032.031	Sum squared resid	6.18E+08
Durbin-Watson stat	2.346445		

Equation: IRM2NFAD = B(3031)*IRBOPDC+B(3032)*IRM2NFAD(-1)

+B(3033)*IRD8589+B(3034)*IRD9708

Observations: 44

R-squared	0.868280	Mean dependent var	4813.920
Adjusted R-squared	0.858401	S.D. dependent var	4320.640
S.E. of regression	1625.844	Sum squared resid	1.06E+08
Durbin-Watson stat	1.889031		

Equation: IRDDVPGDPM = B(3041)*IRGDPM+B(3042)*IRDDVPGDPM(-1) +B(3043)*IRIRS+B(3044)*IRIRNB

Observations: 44

R-squared	0.986936	Mean dependent var	28680.26
Adjusted R-squared	0.985956	S.D. dependent var	18042.19
S.E. of regression	2138.142	Sum squared resid	1.83E+08
Durbin-Watson stat	2.049635		

Equation: IRSDVPGDPM = B(3050)+B(3051)*IRGDPM+B(3052)*IRIRS +B(3053)*IRSDVPGDPM(-1)

Observations: 44

R-squared	0.980083	Mean dependent var	50243.27
Adjusted R-squared	0.978589	S.D. dependent var	28201.91
S.E. of regression	4126.649	Sum squared resid	6.81E+08
Durbin-Watson stat	1.725468		

Equation: IRCUVPGDPM = B(3060)+B(3061)*IRCUVPGDPM(-1) +B(3062)*IRGDPM+B(3063)*IRD5977+B(3064)*IRIRL +B(3065)*IRIRNB+B(3066)*IRD79

Observations: 44

R-squared	0.943314	Mean dependent var	17018.67
Adjusted R-squared	0.934122	S.D. dependent var	10935.36
S.E. of regression	2806.757	Sum squared resid	2.91E+08
Durbin-Watson stat	1.612120		

Equation: IRGRTIV= IRGRTIV(-1)+B(5011)*(IRMGV-IRMGV(-1)) +B(5012)*(IRCV-IRMGV-(IRCV(-1)-IRMGV(-1)))+B(5013)*IRD00 +B(5014)*IRD99

Observations: 44

R-squared	0.991765	Mean dependent var	3463.555
Adjusted R-squared	0.991148	S.D. dependent var	7727.706
S.E. of regression	727.0771	Sum squared resid	21145643
Durbin-Watson stat	1.447764		

Equation: IRGROILV=B(5021)*(1-IRD93)*IREO*(IRXOILD/1000-IRGRDSV/IREM) +B(5022)*IRPDOIL*(IRYOILB-IRXOILB) +B(5023) *IRD93*(0.58*1000+0.42*(IREO-1000))*(IRXOILD/1000-IRGRDSV/IREM) +B(5024)*IRD0008+B(5025)*IRD9597

Observations: 45

R-squared	0.997816	Mean dependent var	10158.62
Adjusted R-squared	0.997598	S.D. dependent var	24900.15
S.E. of regression	1220.461	Sum squared resid	59580974
Durbin-Watson stat	2.203452		

Equation: IRGRMV=IRGRMV(-1)+B(5031)*(IROUTPUTV-IROUTPUTV(-1))

Observations: 44

R-squared	0.395877	Mean dependent var	4437.618
Adjusted R-squared	0.395877	S.D. dependent var	17915.44
S.E. of regression	13924.84	Sum squared resid	8.34E+09
Durbin-Watson stat	1.599178		

Equation: IRGRSV=IRGRSV(-1)+B(5040)*(IROUTPUTV-IROUTPUTV(-1))

Observations: 44

R-squared	0.992984	Mean dependent var	3561.303
Adjusted R-squared	0.992984	S.D. dependent var	8672.055

S.E. of regression	726.3917	Sum squared resid	22688730
Durbin-Watson stat	1.792799		

Equation: IRGRTDV=IRGRTDV(-1)+B(5051)*(IROUTPUTV-IROUTPUTV(-1))

Observations: 44

R-squared	0.992214	Mean dependent var	3906.084
Adjusted R-squared	0.992214	S.D. dependent var	7815.021
S.E. of regression	689.5913	Sum squared resid	20448054
Durbin-Watson stat	2.506710		

Equation: IRIG=IRIG(-1)+B(7011)*(IRGEDV/IRWPI-IRGEDV(-1)/IRWPI(-1)) +B(7012)*IRD76+B(7013)*IRD77+B(7014)*IRD78+B(7015) *IRD79

Observations: 44

R-squared	0.960948	Mean dependent var	22374.81
Adjusted R-squared	0.956942	S.D. dependent var	13098.81
S.E. of regression	2718.048	Sum squared resid	2.88E+08
Durbin-Watson stat	1.943642		

Equation: IRG =IRG(-1) +B(7021)*((IRGECV+IRGESV)/IRWPI-(IRGECV(-1)+IRGESV(-1))/IRWPI(-1))

Observations: 44

R-squared	0.956452	Mean dependent var	32125.71
Adjusted R-squared	0.956452	S.D. dependent var	16141.65
S.E. of regression	3368.465	Sum squared resid	4.88E+08
Durbin-Watson stat	1.156216		

Equation: IRGDPNF=B(7030)+B(7031)*IRK(-1)+B(7032)*(IRIP+IRIG-IRM*IRMACHIMV)+B(7033)*IREMP+B(7034)*IRM*IRMACHIMV+B(7035)*IRD79+B(7036)*IRD8789

Observations: 44

R-squared	0.997787	Mean dependent var	154911.9

Adjusted R-squared	0.997428	S.D. dependent var	84145.35
S.E. of regression	4267.714	Sum squared resid	6.74E+08
Durbin-Watson stat	1.691219		

Equation: IRMG = IRMG(-1)+B(7041)*(IRMGDCIFP-IRMGDCIFP(-1))

Observations: 44

R-squared	0.975540	Mean dependent var	47294.11
Adjusted R-squared	0.975540	S.D. dependent var	27989.89
S.E. of regression	4377.558	Sum squared resid	8.24E+08
Durbin-Watson stat	1.696943		

Equation: IRMNFS=B(7051)*(IRMNFSDCIFP-IRMNFSDCIFP(-1)) +B(7052)*IRMNFS(-1)

Observations: 44

R-squared	0.965181	Mean dependent var	5105.688
Adjusted R-squared	0.964352	S.D. dependent var	4465.816
S.E. of regression	843.1808	Sum squared resid	29860062
Durbin-Watson stat	1.842198		

Equation: IRIP=B(7060)+B(7061)*IRGDPNF(-1)+B(7062)*IRM *IRMACHIMV+B(7063)*IRIRL+B(7064)*IRD7779

Observations: 44

R-squared	0.948674	Mean dependent var	41497.45
Adjusted R-squared	0.943410	S.D. dependent var	21776.65
S.E. of regression	5180.392	Sum squared resid	1.05E+09
Durbin-Watson stat	1.185581		

Equation: IRVAOIL=B(7071)*IRVAOIL(-1)+B(7072)*(IRXOILB-IRXOILB(-1)) +B(7073)*((IRYOILB-IRXOILB)-(IRYOILB(-1) -IRXOILB(-1))) +B(7074)*IRD02

Observations: 44

R-squared	0.997480	Mean dependent var	41440.82
Adjusted R-squared	0.997291	S.D. dependent var	18297.57

S.E. of regression	952.2816	Sum squared resid	36273606
Durbin-Watson stat	2.429974		

Equation: IRCCA = B(7080) +B(7081)*(1+B(7082)*IRD9408)*IRK(-1) +B(7083)*(IRWARCD+ IRWARED+ IRWARMD)+B(7084)*IRD9408

Observations: 44

R-squared	0.997053	Mean dependent var	28759.92
Adjusted R-squared	0.996751	S.D. dependent var	16607.72
S.E. of regression	946.6046	Sum squared resid	34946352
Durbin-Watson stat	0.546358		

Equation: IRC=B(7091)*(IRYD-IRYD(-1))+B(7092)*IRSP(-1)+IRC(-1)

Observations: 44

R-squared	0.992415	Mean dependent var	94286.53
Adjusted R-squared	0.992234	S.D. dependent var	49704.69
S.E. of regression	4380.157	Sum squared resid	8.06E+08
Durbin-Watson stat	2.185584		

Equation: IRXFY = IRXFY(-1) +B(7101)*(IRXFYSD / OECDP - IRXFYSD(-1) / OECDP(-1)) +B(7102)*IRD7879

Observations: 44

R-squared	0.961041	Mean dependent var	4270.748
Adjusted R-squared	0.960114	S.D. dependent var	5326.664
S.E. of regression	1063.816	Sum squared resid	47531587
Durbin-Watson stat	2.156459		

Equation: IRMFY=IRMFY(-1)+ B(7111)*(IRMFYSD/OECDP- IRMFYSD(-1) /OECDP(-1))+B(7112)*IRD7377

Observations: 44

R-squared	0.931728	Mean dependent var	4597.962
Adjusted R-squared	0.930102	S.D. dependent var	5003.115
S.E. of regression	1322.731	Sum squared resid	73483893
Durbin-Watson stat	1.627238		

Equation: IRXOIL=IRXOIL(-1)+B(7122)*(IRXOILB-IRXOILB(-1)) +B(7123) *IRD73+B(7124)*IRD83

Observations: 44

R-squared	0.993982	Mean dependent var	39025.12
Adjusted R-squared	0.993688	S.D. dependent var	18460.02
S.E. of regression	1466.596	Sum squared resid	88187076
Durbin-Watson stat	2.041596		

Equation: IRXNOILG=IRXNOILG(-1)+B(7131)*(IRXGNODOP-IRXGNODOP(-1))

Observations: 44

R-squared	0.919739	Mean dependent var	6953.078
Adjusted R-squared	0.919739	S.D. dependent var	6351.892
S.E. of regression	1799.517	Sum squared resid	1.39E+08
Durbin-Watson stat	2.020752		

Equation: IRXNFS=IRXNFS(-1) + B(7141)*(IRXNFSDOP-IRXNFSDOP(-1))

Observations: 44

R-squared	0.963729	Mean dependent var	1386.083
Adjusted R-squared	0.963729	S.D. dependent var	2198.174
S.E. of regression	418.6390	Sum squared resid	7536119.
Durbin-Watson stat	2.062930		

Equation: IRINPUT = IRINPUT(-1) + B(7151) *(IRGDPF - IRGDPF(-1)) +B(7152)*IRD79

Observations: 44

R-squared	0.981679	Mean dependent var	105251.0
Adjusted R-squared	0.981242	S.D. dependent var	45672.94
S.E. of regression	6255.291	Sum squared resid	1.64E+09
Durbin-Watson stat	2.024889		

Equation: IRII=B(7160)+B(7161)*(IRII(-1)/IROUTPUT(-1))

*(IROUTPUT-IROUTPUT(-1))+B(7162)*IRII(-1)+B(7163)*IRYEAR
+B(7164)*IRPGDPF+B(7165)*(IRD8285+IRD9394+IRD73)

Observations: 44

R-squared	0.748988	Mean dependent var	10707.52
Adjusted R-squared	0.715960	S.D. dependent var	12903.64
S.E. of regression	6877.049	Sum squared resid	1.80E+09
Durbin-Watson stat	2.169334		

Equation: IRGV = IRGV(-1)+ B(9011)*((IRGECV+IRGESV)-(IRGECV(-1) -(IRGESV(-1))))

Observations: 44

R-squared	0.984524	Mean dependent var	16445.91
Adjusted R-squared	0.984524	S.D. dependent var	32824.08
S.E. of regression	4083.418	Sum squared resid	7.17E+08
Durbin-Watson stat	1.294772		

Equation: IRIGV=IRIGV(-1)+B(9021)*(IRGEDV-IRGEDV(-1))
+B(9022) *(IRFEOAV-IRFEOAV(-1))+B(9023)*IROLGV
+B(9024)*IRD9497+B(9025)*IRD02

Observations: 44

R-squared	0.995704	Mean dependent var	12406.64
Adjusted R-squared	0.995263	S.D. dependent var	26041.93
S.E. of regression	1792.298	Sum squared resid	1.25E+08
Durbin-Watson stat	1.067963		

Equation: IRSUBV=IRSUBV(-1)
+B(9031)*(IRGECV+IRGESV-IRGECV(-1)-IRGESV)

Observations: 44

R-squared	0.982782	Mean dependent var	2235.707
Adjusted R-squared	0.982782	S.D. dependent var	4578.416
S.E. of regression	600.7605	Sum squared resid	15519267
Durbin-Watson stat	1.589819		

Equation: IRCV =IRCV(-1)+B(9041)*(IRYDV-IRYDV(-1))
+B(9042)*IRSPV(-1)

Observations: 44

R-squared	0.998997	Mean dependent var	58305.00
Adjusted R-squared	0.998973	S.D. dependent var	117039.8
S.E. of regression	3751.107	Sum squared resid	5.91E+08
Durbin-Watson stat	2.395573		

Equation: IRVAOILV=IRVAOILV(-1)+B(9051)*(IRXOILD/1000*IREO -IRXOILD(-1)/1000*IREO(-1)) +B(9052)*(IRPDOIL*(IRYOILB-IRXOILB) -IRPDOIL(-1)*(IRYOILB(-1)-IRXOILB(-1)))

Observations: 44

R-squared	0.989770	Mean dependent var	21729.30
Adjusted R-squared	0.989526	S.D. dependent var	52344.46
S.E. of regression	5356.993	Sum squared resid	1.21E+09
Durbin-Watson stat	1.777637		

Equation: IRMGV = IRMGV(-1)+ B(9061)*(IRMGD*IREENOIL-IRMGD(-1) *IREENOIL(-1))

Observations: 44

R-squared	0.998884	Mean dependent var	20639.12
Adjusted R-squared	0.998884	S.D. dependent var	47921.75
S.E. of regression	1600.556	Sum squared resid	1.10E+08
Durbin-Watson stat	2.150298		

Equation: IRMNFSV = IRMNFSV(-1)+B(9071)*(IRMNFSD*IREENOIL -IRMNFSD(-1)*IREENOIL(-1))

Observations: 44

R-squared	0.999712	Mean dependent var	3274.553
Adjusted R-squared	0.999712	S.D. dependent var	8676.523
S.E. of regression	147.1187	Sum squared resid	930687.7
Durbin-Watson stat	1.780305		

Equation: IRXFYV = IRXFYV(-1)+B(9081)*(IRXFYSD*IREENOIL-IRXFYSD(-1) *IREENOIL(-1))

Observations: 44

R-squared	0.960298	Mean dependent var	1471.267
Adjusted R-squared	0.960298	S.D. dependent var	4035.218
S.E. of regression	804.0322	Sum squared resid	27798116
Durbin-Watson stat	2.634974		

Equation: IRMFYV = IRMFYV(-1)+B(9090)+B(9091)*(IRMFYSD *IREENOIL-IRMFYSD(-1)*IREENOIL(-1))+B(9092)*IRD93+B(9093) *IRD5992

Observations: 44

R-squared	0.994461	Mean dependent var	2485.129
Adjusted R-squared	0.994045	S.D. dependent var	8059.784
S.E. of regression	621.9580	Sum squared resid	15473269
Durbin-Watson stat	2.200142		

Equation: IRITV=IRITV(-1)+B(9101)*(IRGRTIV-IRGRTIV(-1))

Observations: 44

R-squared	0.946525	Mean dependent var	3180.018
Adjusted R-squared	0.946525	S.D. dependent var	6920.388
S.E. of regression	1600.309	Sum squared resid	1.10E+08
Durbin-Watson stat	0.772404		

Equation: IRIPV=IRIPV(-1)+IROLPV+B(9111)*(IRIRL-IRIRL(-1))+B(9112) *(IRIRNB-IRIRNB(-1))+B(9113) *(IROUTPUTV-IROUTPUTV(-1)) +B(9114)*IRD99+B(9115)*IRD02

Observations: 44

R-squared	0.996964	Mean dependent var	21107.84
Adjusted R-squared	0.996652	S.D. dependent var	45543.10
S.E. of regression	2635.057	Sum squared resid	2.71E+08
Durbin-Watson stat	1.115392		

Equation: IRXOILV=IRXOILV(-1)+B(9121)*(IRXOILD*IREO-IRXOILD(-1) *IREO(-1))+B(9122)*IRD9900

Observations: 44

R-squared	0.995857	Mean dependent var	19320.03
Adjusted R-squared	0.995758	S.D. dependent var	45820.48
S.E. of regression	2984.287	Sum squared resid	3.74E+08
Durbin-Watson stat	1.732997		

Equation: IRXNOILGV=B(9131)*(IRXGNOD*IREENOIL-IRXGNOD(-1) *IREENOIL(-1))+IRXNOILGV(-1)

Observations: 44

R-squared	0.982821	Mean dependent var	6437.762
Adjusted R-squared	0.982821	S.D. dependent var	13143.18
S.E. of regression	1722.672	Sum squared resid	1.28E+08
Durbin-Watson stat	2.182697		

Equation: IRXNFSV=IRXNFSV(-1)+B(9141)*(IRXNFSD*IREENOIL -IRXNFSD(-1)*IREENOIL(-1))

Observations: 44

R-squared	0.998376	Mean dependent var	2034.733
Adjusted R-squared	0.998376	S.D. dependent var	6198.560
S.E. of regression	249.8319	Sum squared resid	2683888.
Durbin-Watson stat	2.770529		

Equation: IRIIV=IRIIV(-1)+B(9151)*(IRIIV(-1)/IRINPUTV(-1)) *(IRINPUTV-IRINPUTV(-1))+B(9152)*(IRIIV(-1)/IRGDPFV(-1)) *(IRGDPFV-IRGDPFV(-1))+B(9153)*IRD00+B(9154)*IRD95 +B(9156)*IRD03

Observations: 44

R-squared	0.976500	Mean dependent var	8696.881
Adjusted R-squared	0.974090	S.D. dependent var	22334.49
S.E. of regression	3595.102	Sum squared resid	5.04E+08

Durbin-Watson stat	1.400184		

Equation: IREM =IREM(-1)+B(20011)*(IRM2V-IRM2V(-1))+B(20012) *IRBOPD+B(20013)*IRGRDSV+B(20014)*IRD99+B(20015)*IRD0208

Observations: 44

R-squared	0.994791	Mean dependent var	1761.154
Adjusted R-squared	0.994257	S.D. dependent var	2756.093
S.E. of regression	208.8659	Sum squared resid	1701374.
Durbin-Watson stat	2.282224		

Equation: IREENOIL= IREO*IRD5978+ (1-IRD5978)*(B(20020) +B(20021)*IREM+(1-B(20021))*IREO)+B(20022)*IREENOIL(-1) +B(20023)*IRD9308

Observations: 44

R-squared	0.989139	Mean dependent var	1170.028
Adjusted R-squared	0.988324	S.D. dependent var	2174.642
S.E. of regression	234.9817	Sum squared resid	2208655.
Durbin-Watson stat	1.280406		

Equation: IRWPIM = IRWPIM(-1)+ B(20031)*(((IRMGD/(IRMGD +IRMNFSD))*IRPM) - ((IRMGD(-1)/(IRMGD(-1)+IRMNFSD(-1))) *IRPM(-1)))

Observations: 44

R-squared	0.988340	Mean dependent var	30.52045
Adjusted R-squared	0.988340	S.D. dependent var	52.20129
S.E. of regression	5.636748	Sum squared resid	1366.236
Durbin-Watson stat	1.008951		

Equation: IRWPIX =IRWPIX(-1)+B(20041)*(((IRXGNOD /(IRXGD+IRXNFSD)) *IRPX) - ((IRXGNOD(-1)/(IRXGD(-1) +IRXNFSD(-1))) *IRPX(-1)))

Observations: 44

R-squared	0.974917	Mean dependent var	42.23386

Adjusted R-squared	0.974917	S.D. dependent var	78.24315
S.E. of regression	12.39193	Sum squared resid	6603.080
Durbin-Watson stat	1.096229		

Equation: IRWPID = IRWPID(-1)+B(20051)*(IRPGDPNF-IRPGDPNF(-1))

Observations: 44

R-squared	0.998342	Mean dependent var	34.59636
Adjusted R-squared	0.998342	S.D. dependent var	60.93320
S.E. of regression	2.481269	Sum squared resid	264.7380
Durbin-Watson stat	1.082955		

Equation: IRWPI =B(20061)*IRWPID+B(20062)*IRWPIM+(1-B(20061) -B(20062)) *IRWPIX

Observations: 45

R-squared	0.999990	Mean dependent var	33.14400
Adjusted R-squared	0.999990	S.D. dependent var	58.95290
S.E. of regression	0.189242	Sum squared resid	1.539945
Durbin-Watson stat	0.891991		

Equation: IRCPI= IRCPI(-1)+B(20071)*(IRPGDPNF-IRPGDPNF(-1)) +B(20072)*IRD00

Observations: 44

R-squared	0.999690	Mean dependent var	35.46295
Adjusted R-squared	0.999683	S.D. dependent var	61.57623
S.E. of regression	1.096394	Sum squared resid	50.48734
Durbin-Watson stat	1.665887		

Equation: IRIRNB = B(20080) + B(20081)* IRIRNB(-1) + B(20082)* (IRSPV-IRSPV(-1)) +(IRCPI-IRCPI(-1))/IRCPI(-1) +B(20083)*IRD7908 +B(20084)*IRD9699

Observations: 44

R-squared	0.919469	Mean dependent var	33.73991

Adjusted R-squared	0.911209	S.D. dependent var	12.05470
S.E. of regression	3.592030	Sum squared resid	503.2046
Durbin-Watson stat	2.349772		

Equation: IRPCCA=IRPCCA(-1)+B(20091)*(IRPK-IRPK(-1))

Observations: 44

R-squared	0.998937	Mean dependent var	0.343501
Adjusted R-squared	0.998937	S.D. dependent var	0.640731
S.E. of regression	0.020886	Sum squared resid	0.018757
Durbin-Watson stat	0.981792		

Equation: IRPINPUT=IRPINPUT(-1)+B(20101)*(IRPGDPF-IRPGDPF(-1))

Observations: 44

R-squared	0.997581	Mean dependent var	0.363349
Adjusted R-squared	0.997581	S.D. dependent var	0.660183
S.E. of regression	0.032467	Sum squared resid	0.045328
Durbin-Watson stat	2.316546		

Equation: IRPOPAPOP=B(31010)+B(31011)*IRPOPAPOP(-1) +B(31012)*IRYEAR+B(31012)*IRD66

Observations: 44

R-squared	0.973313	Mean dependent var	0.283942
Adjusted R-squared	0.972011	S.D. dependent var	0.016846
S.E. of regression	0.002818	Sum squared resid	0.000326
Durbin-Watson stat	1.067449		

Equation: IRPOP =B(31020) +B(31021)*IRPOP(-1)

Observations: 44

R-squared	0.999424	Mean dependent var	42972.48
Adjusted R-squared	0.999411	S.D. dependent var	14719.45
S.E. of regression	357.3454	Sum squared resid	5363221.
Durbin-Watson stat	0.257834		

Equation: IRWINDPGDPM=IRWINDPGDPM(-1)+B(31031)*(IREMP-IREMP(-1)) +B(31032)*(IRGDPM-IRGDPM(-1))+B(31033)*IRD7579 +B(31034)*IRD7880

Observations: 44

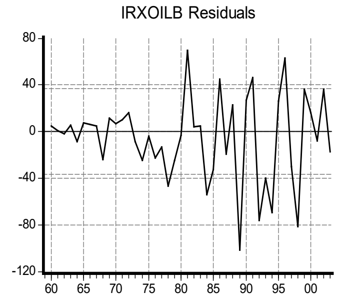
R-squared	0.950250	Mean dependent var	82.80343
Adjusted R-squared	0.946518	S.D. dependent var	33.67609
S.E. of regression	7.787969	Sum squared resid	2426.098
Durbin-Watson stat	1.615398		

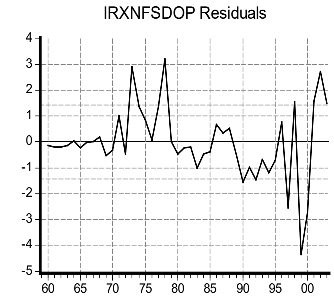
Equation: IREMP=IREMP(-1)+B(31041)*(IRWIND-IRWIND(-1)) +B(31042)*IRPOPA+B(31043)*IRD66+B(31044)*IRD76

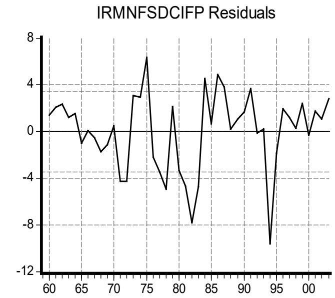
Observations: 44

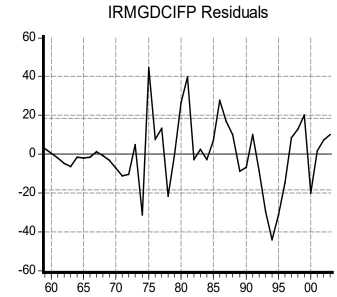
R-squared	0.998777	Mean dependent var	10874.54
Adjusted R-squared	0.998685	S.D. dependent var	3449.517
S.E. of regression	125.0936	Sum squared resid	625936.3
Durbin-Watson stat	1.558868		

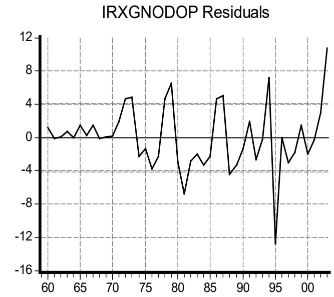
3-2 Plot of Residuals

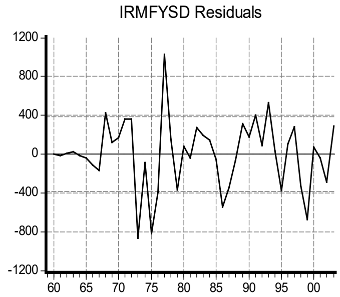


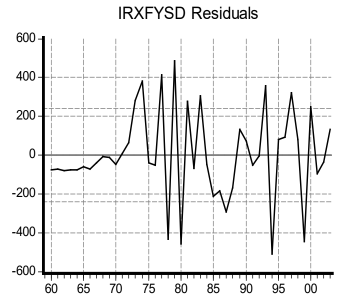


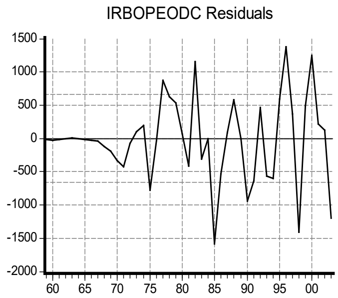


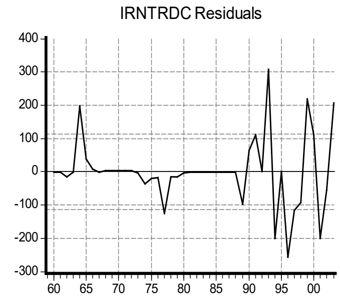


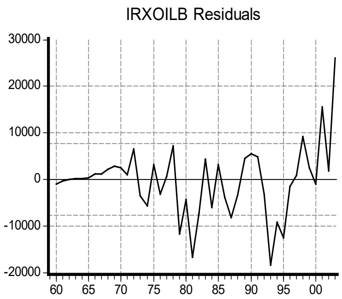


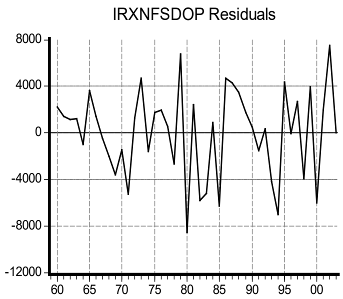


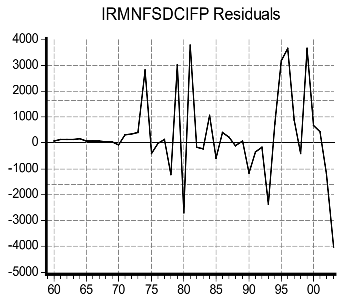


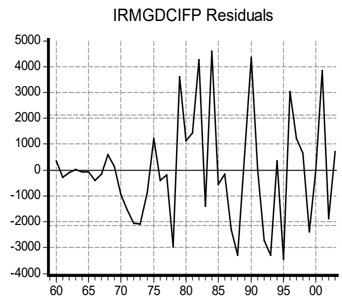


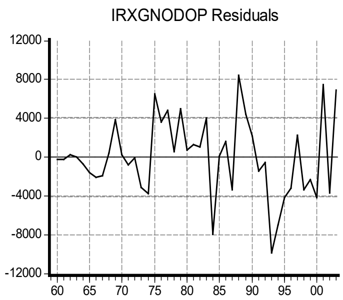


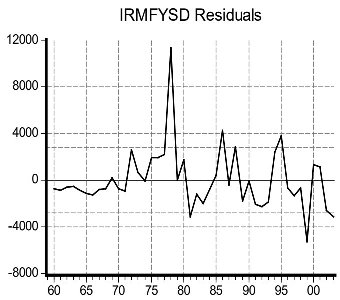


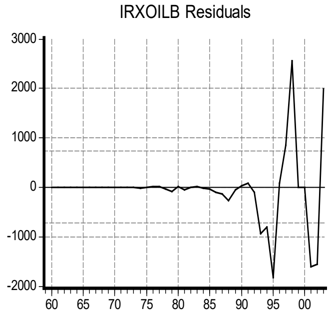








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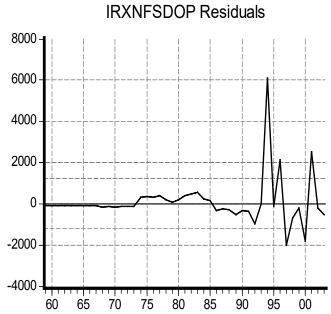
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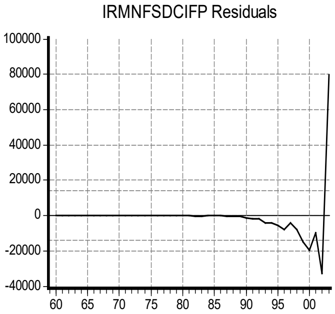
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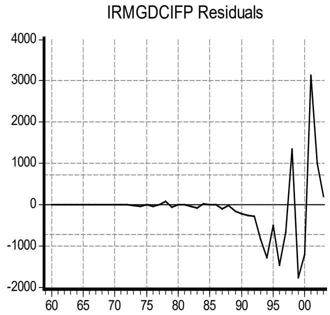
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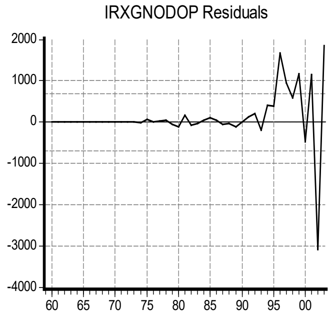
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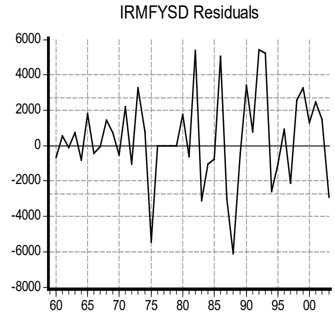
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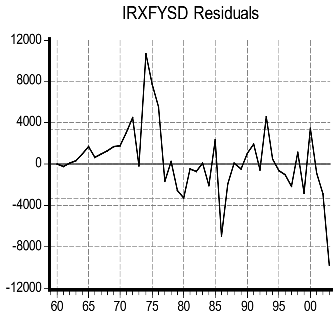
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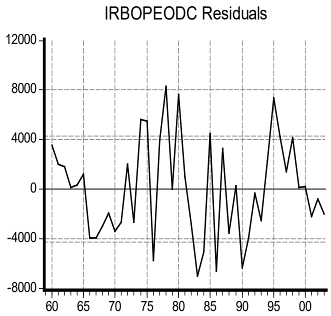
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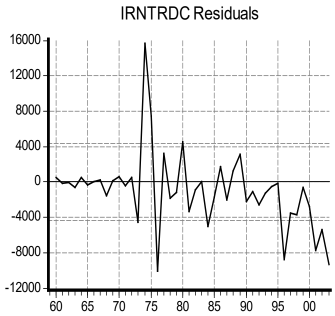
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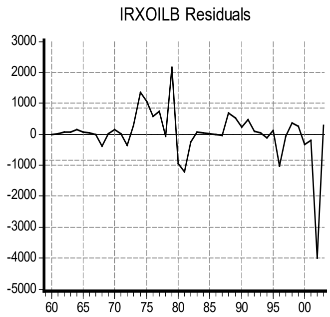
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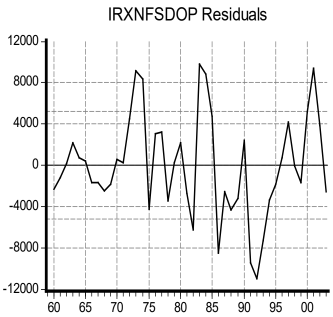
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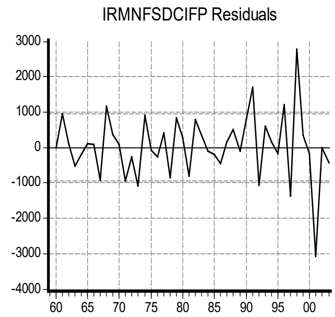
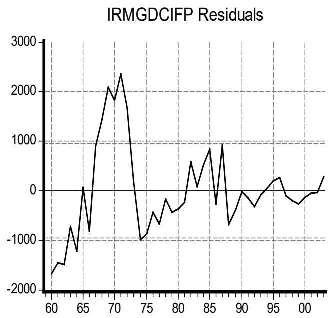

IRMNFSDCIFP Residuals
3000 2000 1000 0 -1000 -2000 -3000 -4000
60 65 70 75 80 85 90 95 00


IRMGDCIFP Residuals
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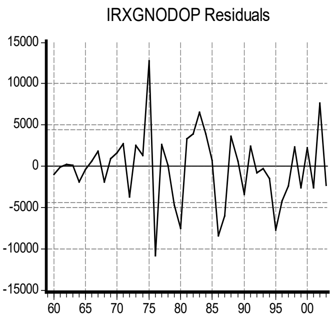
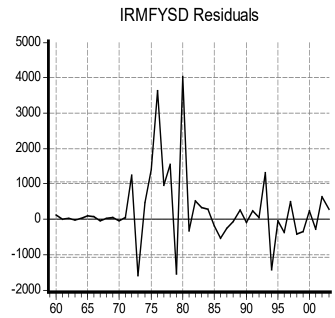
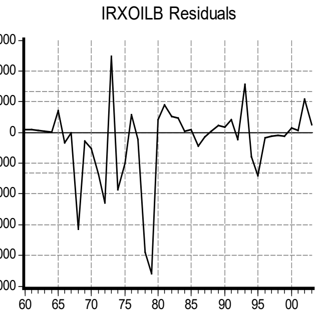
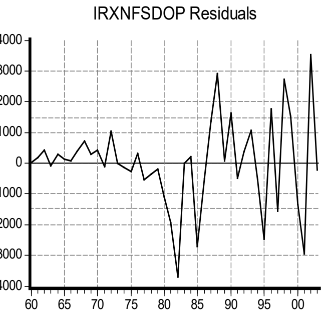
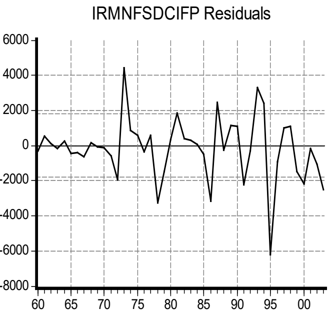
60 65 70 75 80 85 90 95 00


IRXGNODOP Residuals
15000 10000 5000 0 -5000 -10000 -15000
60 65 70 75 80 85 90 95 00


IRMFYSD Residuals
5000 4000 3000 2000 1000 0 -1000 -2000
60 65 70 75 80 85 90 95 00


IRXOILB Residuals
3000 2000 1000 0 -1000 -2000 -3000 -4000 -5000
60 65 70 75 80 85 90 95 00


IRXNFSDOP Residuals
4000 3000 2000 1000 0 -1000 -2000 -3000 -4000
60 65 70 75 80 85 90 95 00


IRMNFSDCIFP Residuals
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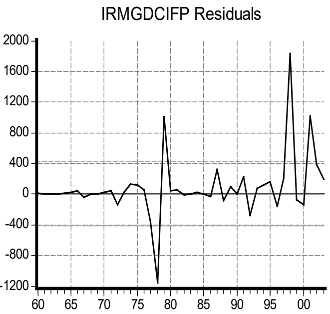
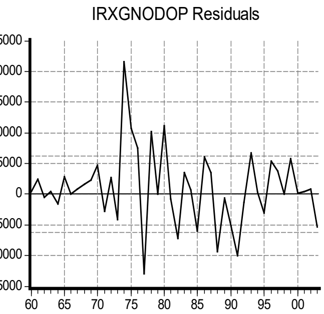
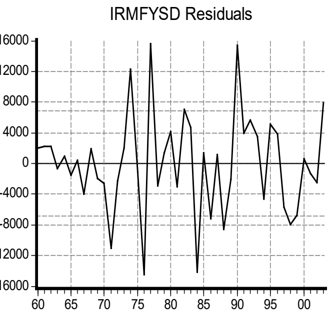
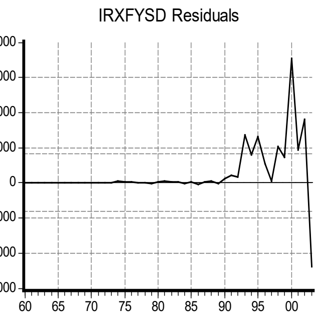
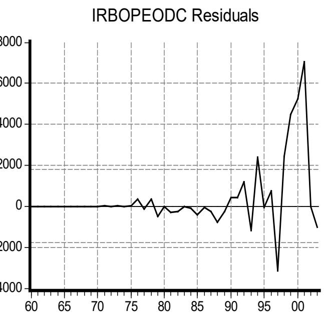
60 65 70 75 80 85 90 95 00

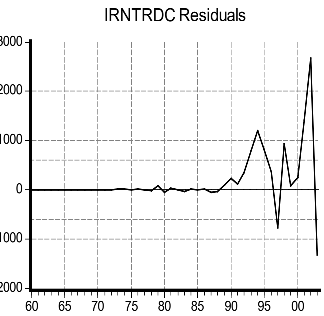

IRMGDCIFP Residuals
2000 1600 1200 800 400 0 -400 -800 -1200
60 65 70 75 80 85 90 95 00


IRXGNODOP Residuals
25000 20000 15000 10000 5000 0 -5000 -10000 -15000
60 65 70 75 80 85 90 95 00


IRMFYSD Residuals
16000 12000 8000 4000 0 -4000 -8000 -12000 -16000
60 65 70 75 80 85 90 95 00


IRXFYSD Residuals
20000 15000 10000 5000 0 -5000 -10000 -15000
60 65 70 75 80 85 90 95 00


IRBOPEODC Residuals
8000 6000 4000 2000 0 -2000 -4000
60 65 70 75 80 85 90 95 00


IRNTRDC Residuals
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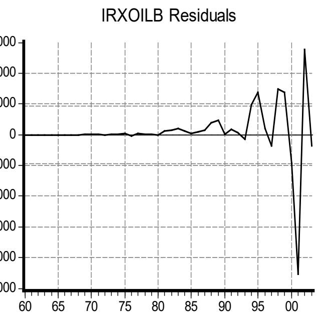
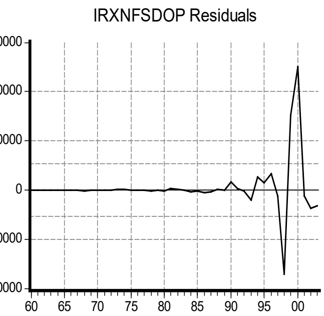
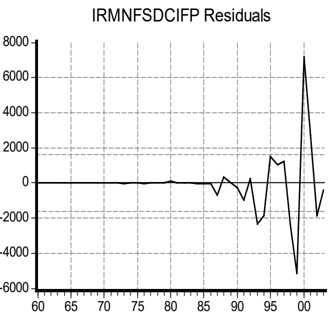
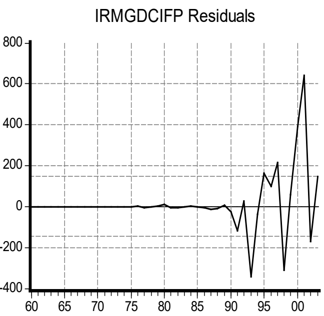
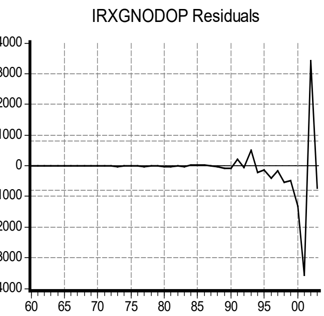
60 65 70 75 80 85 90 95 00

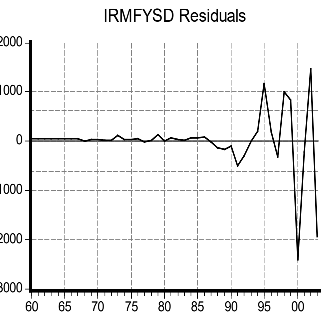

IRXOILB Residuals
12000 8000 4000 0 -4000 -8000 -12000 -16000 -20000
60 65 70 75 80 85 90 95 00


IRXNFSDOP Residuals
30000 20000 10000 0 -10000 -20000
60 65 70 75 80 85 90 95 00


IRMNFSDCIFP Residuals
8000 6000 4000 2000 0 -2000 -4000 -6000
60 65 70 75 80 85 90 95 00


IRMGDCIFP Residuals
800 600 400 200 0 -200 -400
60 65 70 75 80 85 90 95 00


IRXGNODOP Residuals
4000 3000 2000 1000 0 -1000 -2000 -3000 -4000
60 65 70 75 80 85 90 95 00


IRMFYSD Residuals
2000 1000 0 -1000 -2000 -3000
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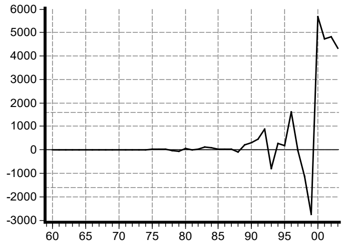
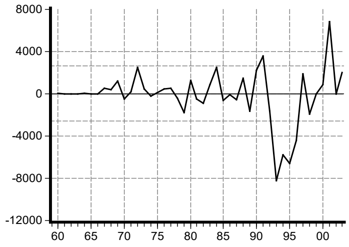
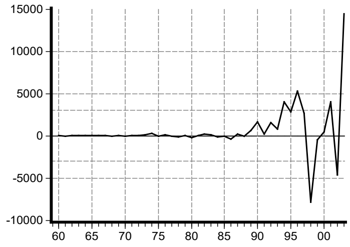
IRXOILB Residuals



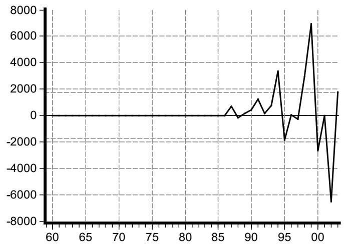
IRXNFSDOP Residuals



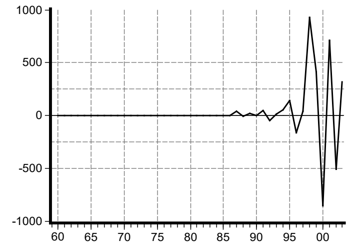
IRMNFSDCIFP Residuals



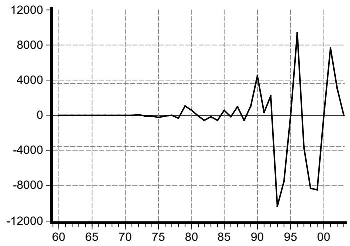
IRMGDCIFP Residuals



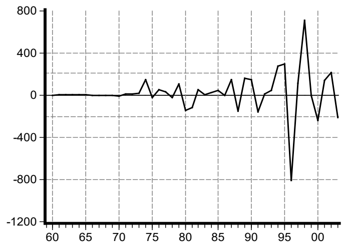
IRXGNODOP Residuals



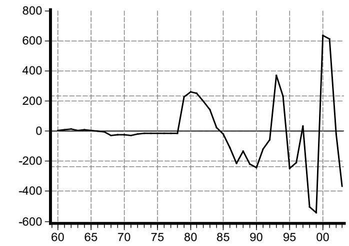
IRMFYSD Residuals



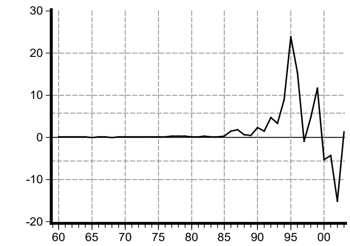
IRXFYSD Residuals



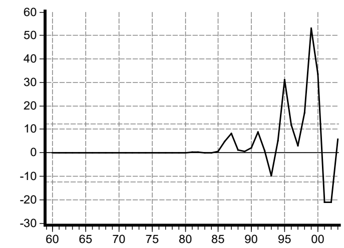
IRBOPEODC Residuals



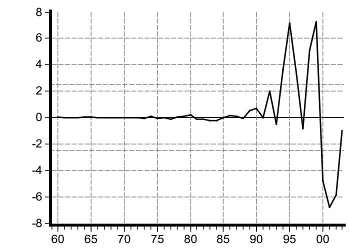
IRNTRDC Residuals



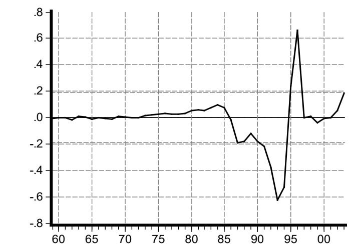
IRXOILB Residuals



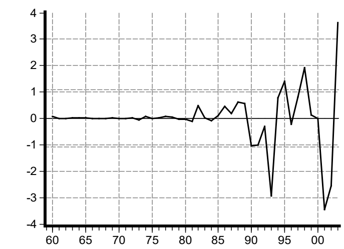
IRXNFSDOP Residuals



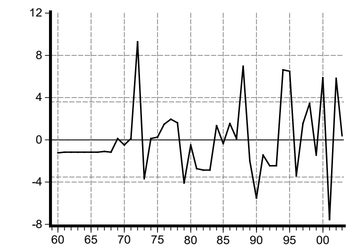
IRMNFSDCIFP Residuals



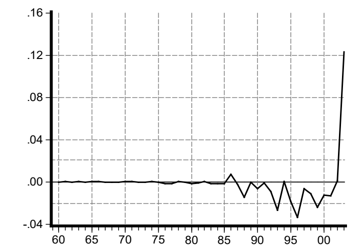
IRMGDCIFP Residuals



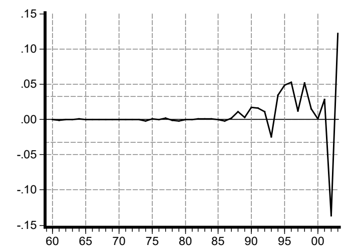
IRXGNODOP Residuals



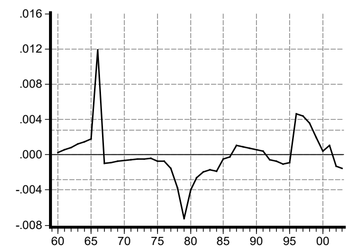
IRMFYSD Residuals



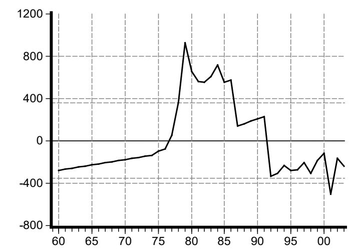
IRXFYSD Residuals

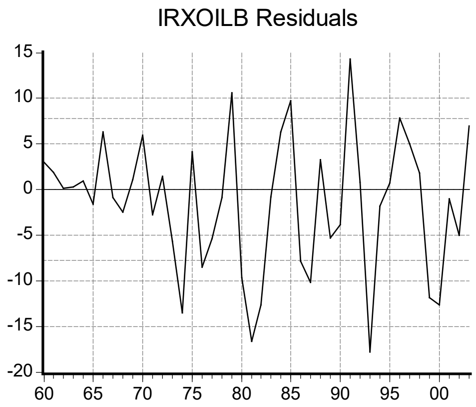


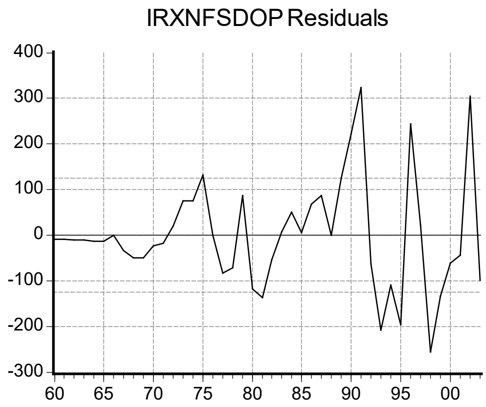
IRBOPEODC Residuals



IRNTRDC Residuals







3-3 Numerical Model

After estimation of parameters of regressions equations, we substitute them in equations and identities, and then rewrite them to build a model consisting of variables, equations and numerical figures. With this model we can evaluate different scenarios and also make predictions. In other words, the numerical model is the estimation of structural form of the model and should be solved for its endogenous variables in order to find reduced form solution. If we solve this model for in-sample period, endogenous variables then, we would attain the ex-post simulation in which the endogenous variables solved values can be used for evaluation of the model and comparison with actual values. If we solve the model for out of sample period for endogenous variables, we can obtain forecasts. If we change exogenous variables within the sample and then solve the model for endogenous variables, then the solved endogenous variables would be on the basis of exogenous shocked variables. This procedure is called shock analysis. We can solve the models in two different static and dynamic ways. In static solution, the real quantities of lagged endogenous variables would be used for every year solution, while in dynamic solution the solved quantities of the same variables would be used for the next period solution as initial values. The solution methods are algorithms available in numerical analysis and computer softwares. In this model we used Gauss-Siedel methods for solving system of simultaneous equations.

The numerical macro econometric model of Iran is as follows:

3-3-1 Foreign Sector

'1: Balance of trade, million Dollars

IRTBD = IRXGD - IRMGD

'2: Balance of services, million Dollars

IRSBD = IRXSD - IRMSD

'3: Current account, million Dollars

IRCAD = IRTBD + IRSBD + IRNTRD

'4: Balance of payments, million Dollars

IRBOPD = IRCAD + IRKAD + IRBOPEOD

'5: Export of goods, million Dollars

IRXGD = IRXOILD + IRXGNOD

'6: Export of nonfactor services, million Dollars

IRXNFSD = IRXNFSDOP * OECDP

'7: Import of nonfactor services, million Dollars

IRMNFSD = IRMNFSDCIFP * IRCIFP

'8: Export of nonoil goods, million Dollars

IRXGNOD = IRXGNODOP * OECDP

'9: Import of goods, million Dollars

IRMGD = IRMGDCIFP * IRCIFP

'10: Export of services, million Dollars

IRXSD = IRXNFSD + IRXFYSD

'11: Import of services, million Dollars

IRMSD = IRMNFSD + IRMFYSD

'12: Balance of factor income services, million Dollars

IRFYSBD = IRXFYSD - IRMFYSD

'13: Balance of nonfactor income services, million Dollars

IRNFSBD = IRXNFSD - IRMNFSD

'14: Cumulative balance of payments, million Dollars

IRBOPDC = IRBOPDC(-1) + IRBOPD

'15: Balance of payments errors and omissions, million Dollars

IRBOPEOD = IRBOPEODC - IRBOPEODC(-1)

'16: Cumulative capital account, million Dollars

IRKADC = IRKADC(-1) + IRKAD

'17: Cumulative current account, million Dollars

IRCADC = IRCADC(-1) + IRCAD

'18: Cumulative balance of trade, million Dollars

IRTBDC = IRTBDC(-1) + IRTBD

'19: Cumulative balance of services, million Dollars

IRSBDC = IRSBDC(-1) + IRSBD

'20: Net transfers, million Dollars

IRNTRD = IRNTRDC - IRNTRDC(-1)

'21: Cumulative factor income services balance, million Dollars

IRFYSBDC = IRFYSBDC(-1) + IRFYSBD

'22: Cumulative nonfactor income services balance, million Dollars

IRNFSBDC = IRNFSBDC(-1) + IRNFSBD

'23: Export of oil, million Dollars

IRXOILD = IRWPOIL * IRXOILB

'101: Export of oil, million barrels/year

IRXOILB = IRXOILB(-1) + 0.938219660989029 * (IRYOILB - IRYOILB(-1))

'102: Export of nonfactor services, million Dollars

IRXNFSDOP = IRXNFSDOP(-1) + 0.000682569696017101 * IREENOIL + 5.17378500181287e-05 * (IRGDPNF - IRGDPNF(- 1)) - 15.6697583249346 *IRD79

'103: Import of nonfactor services, million Dollars

IRMNFSDCIFP = IRMNFSDCIFP(-1) - 3.05399812152603 - 0.0027138529810381 * (IREENOIL * IRCIFP / IRWPI - IREENOIL(-1) * IRCIFP(-1) / IRWPI(-1)) + 0.000349992041300104 * (IRGDPM - IRGDPM(-1)) + 18.2507730337764 * (IRD77 + IRD79 + IRD88 + IRD02)

'104: Real import of goods, million Dollars
IRMGDCIFP = 16.5110152782892 + 0.00758726034031777 * (IRXGD + IRXSD) - 0.0155999570899497 * IREENOIL + 0.00040918946050072 * IRGDPM - 0.807827420 * IRCIFP + 0.006168213941 * IRKAD - 82.0998839343973 * IRD79

'105: Real export of nonoil goods, million Dollars
IRXGNODOP = - 4.95552925025199 + 0.00184718905345488 * IREX * OECDP / IRWPI + 0.791899687 * IRXGNODOP(-1) + 2.49417350263666e-05 * IRGDPNF

'106: Import of factor income services, million Dollars
IRMFYSD = 1768.12953292736 + (2.62096066240585 - 2.24044178954207 * (1 - IRD5977)) * IRKADC * LIBOR / 100 + 0.220231610215998 * IRMFYSD(-1) + 0.259732660714942 * IRD5978 * IRMGD - 1852.22601426248 * IRD5977 + 2379.0127815062 * IRD0208

'107: Export of factor income services, million Dollars
IRXFYSD = 93.4647163913122 + 0.241705728627199 * IRGEFIDC - 1629.94273866802 * (1 - IRD5978) + 0.543661394811902 *IRXFYSD(-1) + 884.23070075558 * IRD0108

'108: Cumulative balance of payments errors and omissions, million Dollars
IRBOPEODC = - 0.129445751393346 * IRKADC - 0.214694669494791 * IRTBDC - 0.0909884804990355 * IRFYSBDC - 0.077252728537398 * IRNFSBDC - 4408.56150133931 * IRD84 - 2495.11845225836 * IRD9495
@ADD IRBOPEODC IRBOPEODC_A

'109: Cumulative net transfers, million Dollars

IRNTRDC = IRNTRDC(-1) + (3967.79270985043 + 0.040286438055829 * IRKADC + 0.0289326409649468 * IRTBDC + 0.135731221538681 * IRFYSBDC + 0.0783889837385004 * IRNFSBDC - 0.0999201347355668 * IRBOPEODC) * (1 - 0.999548453757557 * IRD5988) - 1268.85996639588 * IRD95 + 659.885269860748 * IRD92

@ADD IRNTRDC IRNTRDC_A

3-3-2 Monetary Sector

'201: Net claim of banking system to government sector (including public government), billion Rials

IRM2NGV = IRM2NGGV + IRM2NGSV

'202: Net claim of banking system to public government, billion Rials

IRM2NGGV = IRGBDVC + IRFEOAV + IROLVC

'203: Net claim of banking system to government sector (excluding public government) at constant prices, billion Rials

IRM2NGSV = IRM2NGSVPGDPM * IRPGDPM

'204: Net claim of banking system to private sector at constant prices, billion Rials

IRM2NPV = IRM2NPVPGDPM * IRPGDPM

'205: Cumulative obligatory loans in government budget, billion Rials

IROLVC = IROLVC(-1) + IROLV

'206: Obligatory loans in government budget, billion Rials

IROLV = IROLPV + IROLGV

'207: Demand deposits of private sector, billion Rials

IRDDV = IRDDVPGDPM * IRPGDPM

'208: Saving and time deposits of private sector, billion Rials

IRSDV = IRSDVPGDPM * IRPGDPM

'209: Currency in hands of public, billion Rials

IRCUV = IRCUVPGDPM * IRPGDPM

'210: Liquidity, billion Rials

IRM2V = IRCUV + IRDDV + IRSDV

'211: Net foreign assets of banking system, billion Rials

IRM2NFAV = IRM2NFAD/(((1 - IRD93 - IRD90 - IRD91 - IRD92)/IREO + IRD93/1748 + IRD90/221.89 + IRD91 / 351.9 + IRD92 / 641.2) * 1000)

'212: Net worth and other items net of banking system, billion Rials

IRM2NWV = IRM2V - (IRM2NPV + IRM2NGV + IRM2NFAV)

'301: Net claim of banking system to private sector at constant prices, billion Rials

IRM2NPVPGDPM = IRM2NPVPGDPM(-1) + 283.741168101271 * IRIRL + 15796.2097910306 * IRD7576

'302: Net claim of banking system to government sector (excluding public government) at constant prices, billion Rials

IRM2NGSVPGDPM = - 8231.79335917287 + 0.972870751248482 * IRM2NGSVPGDPM(-1) + 902.12580917852 * IRIRL -

17383.1355952897 * IRD9497 + 0.203181633455968 * IRD5978 * IRM2NGSVPGDPM(-1) - 28307.4013405444 * IRD0308

'303: Net foreign assets of banking system, million Dollars
IRM2NFAD = 0.462007339847666 * IRBOPDC + 0.52727956183173 * IRM2NFAD(-1) + 3703.50912902718 * IRD8589 - 3417.567938637 * IRD9708
@ADD IRM2NFAD IRM2NFAD_A

'304: Real demand deposits of private sector, billion Rials
IRDDVPGDPM = 0.0533941481966076 * IRGDPM + 0.764757356355431 * IRDDVPGDPM(-1) - 1200.08473270475 * IRIRS + 166.77751729199 * IRIRNB

'305: Real saving and time deposits of private sector, billion Rials
IRSDVPGDPM = 5025.71620787825 + 0.142899784772385 * IRGDPM - 2611.81984225487 * IRIRS + 0.734613587671955 * IRSDVPGDPM(-1)

'306: Real currency in hands of public, billion Rials
IRCUVPGDPM = 22432.1853715911 + 0.652366601466275 * IRCUVPGDPM(-1) + 0.042998998765147 * IRGDPM - 10777.3860612993 * IRD5977 - 909.958384804754 * IRIRL - 316.513599316306 * IRIRNB - 5943.09724903663 * IRD79

3-3-3 Government Sector

'401: Cumulative government budget deficit, billion Rials
IRGBDVC = IRGBDVC(-1) - IRGBDV

'402: Government revenue, billion Rials
IRGRV = IRGROILV + IRGRTV + IRGRMV + IRGRDSV + IRGRSV

'403: Government tax revenue, billion Rials

IRGRTV = IRGRTDV + IRGRTIV

'404: Government expenditure, billion Rials

IRGEV = IRGECV + IRGEDV + IRGESV + IRGESPV + IRGEFIV

'405: Government budget deficit, billion Rials

IRGBDV = IRGRV - IRGEV

'406: Government special expenditures, billion Rials

IRGESV = IRGRSV

'407: Cumulative government expenditures in foreign investment, million Dollars

IRGEFIDC = IRGEFIDC(-1) + IRGEFIV / IREO * 1000

'501: Government indirect tax revenue, billion Rials

IRGRTIV = IRGRTIV(-1) + 0.0845209726751653 * (IRMGV - IRMGV(-1)) + 0.0620223728120182 * (IRCV - IRMGV - (IRCV(-1) - IRMGV(-1))) - 10574.5711878496 * IRD00 + 9187.66180601514 * IRD99

'502: Government oil revenue, billion Rials

IRGROILV = 0.503499865086171 * (1 - IRD93) * IREO * (IRXOILD / 1000 - IRGRDSV / IREM) + 0.131925509284833 * IRPDOIL * (IRYOILB - IRXOILB) + 0.794729381077723 * IRD93 * (0.58 * 1000 + 0.42 * (IREO - 1000)) * (IRXOILD / 1000 - IRGRDSV / IREM) - 7967.08565092122 * IRD0008 + 10696.1383964262 * IRD9597

@ADD IRGROILV IRGROILV_A

'503: Government miscellaneous revenue, billion Rials

IRGRMV = IRGRMV(-1) + 0.0992005759280093 * (IROUTPUTV - IROUTPUTV(-1))

'504: Government special revenue, billion Rials

IRGRSV = IRGRSV(-1) + 0.0275731372132124 * (IROUTPUTV - IROUTPUTV(-1))

'505: Government direct tax revenue, billion Rials

IRGRTDV = IRGRTDV(-1) + 0.0171195888589719 * (IROUTPUTV - IROUTPUTV(-1))

3-3-4 Real Sector

'601: Aggregate demand at constant prices, billion Rials

IRAD = IRINPUT + IRC + IRG + IRI + IRDIS + IRX + IRTOT

'602: Aggregate supply at constant prices, billion Rials

IRAS = IROUTPUT + IRNIT + IRM + IRTOT

'603: Aggregate output at constant prices, billion Rials

IROUTPUT = IRINPUT + IRGDPF

'604: Gross national saving at constant prices, billion Rials

IRGNS = IRI + IRII + IRBOT + IRNFY + IRTOT

'605: Net national saving at constant prices, billion Rials

IRNNS = IRGNS - IRCCA

'606: Export at constant prices, billion Rials

IRX = IRXOIL + IRXNOILG + IRXNFS

'607: Import at constant prices, billion Rials

IRM = IRMG + IRMNFS

'608: Balance of trade at constant prices, billion Rials

IRBOT = IRX - IRM

'609: Gross domestic expenditure at market price at constant prices, billion Rials

IRGDEM = IRC + IRG + IRI + IRBOT + IRDIS

'610: Private saving at constant prices, billion Rials

IRSP = IRYD - IRC

'611: Terms of trade, billion Rials

IRTOT = 2 * ((IRXV * IRM) - (IRMV * IRX)) / (IRXV + IRMV)

'612: Gross domestic income at market price at constant prices, billion Rials

IRGDIM = IRGDPM + IRTOT

'613: Discrepancies at constant prices, billion Rials

IRDIS = IRGDPM - (IRC + IRG + IRI + IRBOT)

'614: Gross national product at market price at constant prices, billion Rials

IRGNPM = IRGDPM + IRNFY

'615: Gross national income at market price, billion Rials

IRGNIM = IRGNPM + IRTOT

'616: Net national income at factor cost at constant prices, billion Rials

IRNNIF = IRGNIM - IRCCA - IRNIT

'617: Net factor income at constant prices, billion Rials

IRNFY = IRXFY - IRMFY

'618: Net indirect taxes at constant prices, billion Rials

IRNIT = IRIT - IRSUB

'619: Capital stock at constant prices, billion Rials

IRK = IRK(-1) + IRI - IRCCA

'620: Gross domestic product at market price at constant prices, billion Rials

IRGDPM = IRGDPNF + IRVAOIL + IRNIT

'621: Disposable income at constant prices, billion Rials

IRYD = IRGDPNF + IRNFY - IRCCA - IRGRTDV / IRPIT

'622: Investment at constant prices, billion Rials

IRI = IRIP + IRIG

'623: Indirect taxes at constant prices, billion Rials

IRIT = IRITV / IRPIT

'624: Subsidies at constant prices, billion Rials

IRSUB = IRSUBV / IRPSUB

'625: Gross domestic product at factor cost at constant prices, billion Rials

IRGDPF = IRGDPNF + IRVAOIL

'701: Government investment at constant prices, billion Rials
IRIG = IRIG(-1) + 61.9404117914044 * (IRGEDV / IRWPI - IRGEDV(-1) / IRWPI(-1)) + 18381.8267166231 * IRD76 - 15923.2592452017 * IRD77 + 26253.7391532268 * IRD78 - 21355.6113562294 * IRD79
@ADD IRIG IRIG_A

'702: Government consumption at constant prices, billion Rials
IRG = IRG(-1) + 16.8074389456477 * ((IRGECV + IRGESV) / IRWPI - (IRGECV(-1) + IRGESV(-1)) / IRWPI(-1))
@ADD IRG IRG_A

'703: Nonoil gross domestic product at market price at constant prices, billion Rials
IRGDPNF = - 37400.2494143445 + 0.0684531883732225 * IRK(-1) + 0.885108543493942 * (IRIP + IRIG - IRM * IRMACHIMV) + 9.21612492641659 * IREMP + 0.251089935461097 * IRM * IRMACHIMV + 23054.6954966312 * IRD79 - 17816.2851989548 * IRD8789

'704: Import if goods at constant prices, billion Rials
IRMG = IRMG(-1) + 372.470156609936 * (IRMGDCIFP - IRMGDCIFP(-1))
@ADD IRMG IRMG_A

'705: Import of nonfactor services at constant prices, billion Rials
IRMNFS = 343.970028080269 * (IRMNFSDCIFP - IRMNFSDCIFP(-1)) + 0.964322749918179 * IRMNFS(-1)
@ADD IRMNFS IRMNFS_A

'706: Private investment at constant prices, billion Rials
IRIP = 12470.9997122356 + 0.202116871357174 * IRGDPNF(-1) + 1.73564194426407 * IRM * IRMACHIMV - 2298.97111013849 * IRIRL - 19862.5134366786 * IRD7779

'707: Value added of oil at constant prices, billion Rials
IRVAOIL = 0.995004257665674 * IRVAOIL(-1) + 40.8979705445623 * (IRXOILB - IRXOILB(-1)) + 7.7494888618803 * ((IRYOILB - IRXOILB) - (IRYOILB(-1) - IRXOILB(-1))) + 4261.25996476045 * IRD02
@ADD IRVAOIL IRVAOIL_A

'708: Capital consumption allowances at constant prices, billion Rials
IRCCA = 5286.01614857171 + 0.0358810913464453 * (1 - 0.372029574287411 * IRD9408) * IRK(-1) + 0.0151046091932582 * (IRWARCD + IRWARED + IRWARMD) + 14706.7631752993 * IRD9408

'709: Private consumption at constant prices, billion Rials
IRC = 0.329782294753259 * (IRYD - IRYD(-1)) + 0.101947036926304 * IRSP(-1) + IRC(-1)

'710: Export of factor income from abroad at constant prices, billion Rials
IRXFY = IRXFY(-1) + 244.489147792064 * (IRXFYSD / OECDP - IRXFYSD(-1) / OECDP(-1)) - 5058.13331466782 * IRD7879
@ADD IRXFY IRXFY_A

'711: Import of factor income from abroad at constant prices, billion Rials
IRMFY = IRMFY(-1) + 165.240221381024 * (IRMFYSD / OECDP - IRMFYSD(-1) / OECDP(-1)) + 2780.46261143527 * IRD7377
@ADD IRMFY IRMFY_A

'712: Oil export at constant prices, billion Rials

IRXOIL = IRXOIL(-1) + 39.2760541522738 * (IRXOILB - IRXOILB(-1)) - 5884.91789740142 * IRD73 + 4822.32018610658 * IRD83

@ADD IRXOIL IRXOIL_A

'713: Export of goods at constant prices, billion Rials

IRXNOILG = IRXNOILG(-1) + 472.401973079406 * (IRXGNODOP - IRXGNODOP(-1))

@ADD IRXNOILG IRXNOILG_A

'714: Export of nonfactor services at constant prices, billion Rials

IRXNFS = IRXNFS(-1) + 174.249591522684 * (IRXNFSDOP - IRXNFSDOP(-1))

@ADD IRXNFS IRXNFS_A

'715: Input of production at constant prices, billion Rials

IRINPUT = IRINPUT(-1) +0.481403708420153*(IRGDPF - IRGDPF(-1)) - 37556.9240086233 * IRD79

'716: Change in inventory at constant prices, billion Rials

IRII = - 897246.888600686 + 1.91462681045212 * (IRII(-1) / IROUTPUT(-1)) * (IROUTPUT - IROUTPUT(-1)) + 0.333426054756428 * IRII(-1) + 668.937410197644 * IRYEAR - 8342.25190018718 * IRPGDPF - 19719.7282419588 * (IRD8285 + IRD9394 + IRD73)

3-3-5 Nominal Variables

'801: Aggregate demand at current prices, billion Rials

IRADV = IRINPUTV + IRCV + IRGV + IRIV + IRDISV + IRXV

'802: Aggregate supply at current prices, billion Rials

IRASV = IROUTPUTV + IRNITV + IRMV

'803: Aggregate output at current prices, billion Rials

IROUTPUTV = IRINPUTV + IRGDPFV

'804: Aggregate input at current prices, billion Rials

IRINPUTV = IRPINPUT * IRINPUT

'805: Gross national saving at current prices, billion Rials

IRGNSV = IRIV + IRIIV + IRBOTV + IRNFYV

'806: Net national saving at current prices, billion Rials

IRNNSV = IRGNSV - IRCCAV

'807: Export at current prices, billion Rials

IRXV = IRXOILV + IRXNOILGV + IRXNFSV

'808: Import at current prices, billion Rials

IRMV = IRMGV + IRMNFSV

'809: Balance of trade at current prices, billion Rials

IRBOTV = IRXV - IRMV

'810: Gross domestic expenditure at market price at current prices, billion Rials

IRGDEMV = IRCV + IRGV + IRIV + IRBOTV + IRDISV

'811: Private saving at current prices, billion Rials

IRSPV = IRYDV - IRCV

'812: Capital stock at current prices, billion Rials

IRKV = IRKV(-1) * (1 + (IRPI - IRPI(-1)) / IRPI(-1)) + IRIV - IRCCAV

'813: Gross domestic income at market price at current prices, billion Rials

IRGDIMV = IRGDPMV

'814: Gross national income at market price at current prices, billion Rials

IRGNIMV = IRGNPMV

'815: Net national income at factor cost at current prices, billion Rials

IRNNIFV = IRGNIMV - IRCCAV - IRNITV

'816: Nonoil gross domestic product at market price at current prices, billion Rials

IRGDPNFV = IRPGDPNF * IRGDPNF

'817: Gross national product at market price at current prices, billion Rials

IRGNPMV = IRGDPMV + IRNFYV

'818: Gross domestic product at market price at current prices, billion Rials

IRGDPMV = IRGDPNFV + IRVAOILV + IRNITV

'819: Disposable income at current prices, billion Rials

IRYDV = IRGDPNFV + IRNFYV - IRCCAV - IRGRTDV

'820: Capital consumption allowances at current prices, billion Rials

IRCCAV = IRCCA * IRPCCA

'821: Investment at current prices, billion Rials

IRIV = IRIGV + IRIPV

'822: Discrepancies at current prices, billion Rials

IRDISV = IRGDPMV - (IRCV + IRGV + IRIV + IRBOTV)

'823: Net indirect taxes at current prices, billion Rials

IRNITV = IRITV - IRSUBV

'824: Net factor income at current prices, billion Rials

IRNFYV = IRXFYV - IRMFYV

'825: Gross domestic product at factor cost at current prices, billion Rials

IRGDPFV = IRGDPNFV + IRVAOILV

'901: Government consumption at current prices, billion Rials

IRGV = IRGV(-1) + 0.152953091937047 * ((IRGECV + IRGESV) - (IRGECV(-1) - (IRGESV(-1))))

'902: Government investment at current prices, billion Rials

IRIGV = IRIGV(-1) + 0.841843897868361 * (IRGEDV - IRGEDV(-1)) + 0.451966289810558 * (IRFEOAV - IRFEOAV(-1)) + 0.675673007904196 * IROLGV - 9016.32694413595 * IRD9497 + 27815.2885737334 * IRD02

'903: Subsidies at current prices, billion Rials

IRSUBV = IRSUBV(-1) + 0.0501705584836369 * (IRGECV + IRGESV - IRGECV(-1) - IRGESV)

'904: Private consumption at current prices, billion Rials

IRCV = IRCV(-1) + 0.368968347253475 * (IRYDV - IRYDV(-1)) + 0.357412468175053 * IRSPV(-1)

'905: Value added of oil sector at current prices, billion Rials
IRVAOILV = IRVAOILV(-1) + 0.712555384021554 * (IRXOILD / 1000 * IREO - IRXOILD(-1) / 1000 * IREO(-1)) + 0.40239276135968 * (IRPDOIL * (IRYOILB - IRXOILB) - IRPDOIL(-1) * (IRYOILB(-1) - IRXOILB(-1)))

'906: Import of goods at current prices, billion Rials
IRMGV = IRMGV(-1) + 0.00100606412832397 * (IRMGD * IREENOIL - IRMGD(-1) * IREENOIL(-1))
@ADD IRMGV IRMGV_A

'907: Import of nonfactor services at current prices, billion Rials
IRMNFSV = IRMNFSV(-1) + 0.000983273632247925 * (IRMNFSD * IREENOIL - IRMNFSD(-1) * IREENOIL(-1))
@ADD IRMNFSV IRMNFSV_A

'908: Export of factor income from abroad at current prices, billion Rials
IRXFYV = IRXFYV(-1) + 0.00117529015971641 * (IRXFYSD * IREENOIL - IRXFYSD(-1) * IREENOIL(-1))
@ADD IRXFYV IRXFYV_A

'909: Import of factor income from abroad at current prices, billion Rials
IRMFYV = IRMFYV(-1) - 1210.9640986965 + 0.00128875560429438 * (IRMFYSD * IREENOIL - IRMFYSD(-1) * IREENOIL(-1)) + 2290.31546284609 * IRD93 + 1163.85519285212 * IRD5992
@ADD IRMFYV IRMFYV_A

'910: Indirect taxes at current prices, billion Rials
IRITV = IRITV(-1) + 0.423050505191631 * (IRGRTIV - IRGRTIV(-1))

'911: Private investment at current prices, billion Rials
IRIPV = IRIPV(-1) + IROLPV - 846.853992362359 * (IRIRL - IRIRL(-1)) - 251.912031089979 * (IRIRNB - IRIRNB(-1)) + 0.121572113358385 * (IROUTPUTV - IROUTPUTV(-1)) - 9378.27570338482 * IRD99 - 11455.4621081743 * IRD02

'912: Oil export at current prices, billion Rials
IRXOILV = IRXOILV(-1) + 0.000644306240555994 * (IRXOILD * IREO - IRXOILD(-1) * IREO(-1)) + 25627.5191471187 * IRD9900
@ADD IRXOILV IRXOILV_A

'913: Nonoil goods export at current prices, billion Rials
IRXNOILGV = 0.000870491409896767 * (IRXGNOD * IREENOIL - IRXGNOD(-1) * IREENOIL(-1)) + IRXNOILGV(-1)
@ADD IRXNOILGV IRXNOILGV_A

'914: Nonfactor services export at current prices, billion Rials
IRXNFSV = IRXNFSV(-1) + 0.000964161304207437 * (IRXNFSD * IREENOIL - IRXNFSD(-1) * IREENOIL(-1))
@ADD IRXNFSV IRXNFSV_A

'915: Change in inventory at current prices, billion Rials
IRIIV = IRIIV(-1) - 2.60866226095188 * (IRIIV(-1) / IRINPUTV(-1)) * (IRINPUTV - IRINPUTV(-1)) + 3.11847667431389 * (IRIIV(-1) / IRGDPFV(-1)) * (IRGDPFV - IRGDPFV(-1)) + 30557.1220505119 * IRD00 + 14290.9065728284 * IRD95 + 33592.6188238164 * IRD03

3-3-6 Price

'1001: Implicit price deflator corresponding aggregate demand and supply

IRPA = IRADV / IRAS

'1002: Gross domestic product at factor cost implicit price deflator

IRPGDPF = IRGDPFV / IRGDPF

'1003: Gross national saving implicit price deflator

IRPGNS = IRGNSV / IRGNS

'1004: Net national saving implicit price deflator

IRPNNS = IRNNSV / IRNNS

'1005: Import of goods implicit price deflator

IRPMG = IRMGV / IRMG

'1006: Import of nonfactor services implicit price deflator

IRPMNFS = IRMNFSV / IRMNFS

'1007: Export of oil implicit price deflator

IRPXOIL = IRXOILV / IRXOIL

'1008: Export of nonoil goods implicit price deflator

IRPXNOILG = IRXNOILGV / IRXNOILG

'1009: Export of nonfactor services implicit price deflator

IRPXNFS = IRXNFSV / IRXNFS

'1010: Balance of trade implicit price deflator

IRPBOT = IRBOTV / IRBOT

'1011: Gross domestic expenditure at market price implicit price deflator

IRPGDEM = IRGDEMV / IRGDEM

'1012: Private saving implicit price deflator

IRPSP = IRSPV / IRSP

'1013: Capital stock implicit price deflator

IRPK = IRKV / IRK

'1014: Gross domestic product implicit price deflator

IRPGDPM = IRGDPMV / IRGDPM

'1015: Private consumption implicit price deflator

IRPC = IRCV / IRC

'1016: Government investment implicit price deflator

IRPIG = IRIGV / IRIG

'1017: Private investment implicit price deflator

IRPIP = IRIPV / IRIP

'1018: Government consumption implicit price deflator

IRPG = IRGV / IRG

'1019: Net indirect taxes implicit price deflator

IRPNIT = IRNITV / IRNIT

'1020: Import implicit price deflator

IRPM = IRMV / IRM

'1021: Export implicit price deflator

IRPX = IRXV / IRX

'1022: Net factor income from abroad implicit price deflator
IRPNFY = IRNFYV / IRNFY

'1023: Export of factor income from abroad implicit price deflator
IRPXFY = IRXFYV / IRXFY

'1024: Import of factor income from abroad implicit price deflator
IRPMFY = IRMFYV / IRMFY

'1025: Oil value added implicit price deflator
IRPVAOIL = IRVAOILV / IRVAOIL

'1026: Investment implicit price deflator
IRPI = IRIV / IRI

'1027: Inflation rate, consumer price index
IRINFCPI = (IRCPI - IRCPI(-1)) / IRCPI(-1)

'1028: Inflation rate, wholesale price index
IRINFWPI = (IRWPI - IRWPI(-1)) / IRWPI(-1)

'1029: Gross national product implicit price deflator
IRPGNPM = IRGNPMV / IRGNPM

'1030: Discrepancies implicit price deflator
IRPDIS = IRDISV / IRDIS

'1031: Gross domestic income implicit price deflator

IRPGDIM = IRGDIMV / IRGDIM

'1032: Gross national income implicit price deflator

IRPGNIM = IRGNIMV / IRGNIM

'1033: Disposable income implicit price deflator

IRPYD = IRYDV / IRYD

'1034: Net national income implicit price deflator

IRPNNIF = IRNNIFV / IRNNIF

'1035: Nonoil gross domestic product implicit price deflator

IRPGDPNF = (IRCV + IRGV + IRIV + IRXV - IRMV + IRDISV - IRVAOILV - IRNITV) / IRGDPNF

'1036: Indirect taxes implicit price deflator

IRPIT = IRPGDPF

'1037: Subsidies implicit price deflator

IRPSUB = IRPGDPF

'1038: Output implicit price deflator

IRPOUTPUT = IROUTPUTV / IROUTPUT

'1039: Change in inventory implicit price deflator

IRPII = IRIIV / IRII

'2001: Market exchange rate, Rials/Dollar

IREM = (IREM(-1) + 0.0547785267815805 * (IRM2V - IRM2V(-1)) - 0.0319670923705237 * IRBOPD - 0.082960389084925 * IRGRDSV +

1990.75013343989 * IRD99 - 5344.13293610647 * IRD0208) * IRD5901 + (1- IRD5901) * IREO
Note: Specification of this equation has been changed for forecasting.

'2002: Effective exchange rate for nonoil goods and services, Rials/Dollar
IREENOIL = (IREO *IRD5978 + (1 - IRD5978) * (-277.256338639297 + 0.6014144394007 * IREM + (1 - 0.6014144394007) * IREO) + 0.191949356847768 * IREENOIL(-1) - 908.976270602465 * IRD9308) * IRD5901 + (1 - IRD5901) * IREO
Note: Specification of this equation has been changed for forecasting.

'2003: Wholesale price index for imported goods
IRWPIM = IRWPIM(-1) + 38.8944948825532 * (((IRMGD / (IRMGD + IRMNFSD)) * IRPM) - ((IRMGD(-1) / (IRMGD(-1) + IRMNFSD(-1))) * IRPM(-1)))

'2004: Wholesale price index for exported goods
IRWPIX = IRWPIX(-1) + 185.08600446346 * (((IRXGNOD / (IRXGD + IRXNFSD))*IRPX) - ((IRXGNOD(-1) / (IRXGD(-1) + IRXNFSD(- 1))) * IRPX(- 1)))

'2005: Wholesale price index for domestically produced and consumed goods
IRWPID = IRWPID(-1) + 83.8734605388956 * (IRPGDPNF - IRPGDPNF(-1))

'2006: Wholesale price index
IRWPI = 0.714236497328726 * IRWPID + 0.245998924780819 * IRWPIM + (1 - 0.714236497328726 - 0.245998924780819) * IRWPIX
@ADD IRWPI IRWPI_A

'2007: Consumer price index

IRCPI = IRCPI(-1) + 99.8795501547877 * (IRPGDPNF - IRPGDPNF(-1)) - 13.496357346761 * IRD00

'2008: Non-organized market interest rate

IRIRNB = 12.568231353827 + 0.429251081760716 * IRIRNB(-1) + 0.000428095004912412 * (IRSPV - IRSPV(-1)) + (IRCPI - IRCPI(-1)) / IRCPI(-1)+10.6201577223518 *IRD7908 - 6.86660754420637 * IRD9699

'2009: Capital consumption allowances implicit price deflator

IRPCCA = IRPCCA(-1) + 1.04981684653527 * (IRPK - IRPK(-1))

'2010: Input implicit price deflator

IRPINPUT = IRPINPUT(- 1) + 0.810102965608117 * (IRPGDPF - IRPGDPF(- 1))

3-3-7 Labor Market

'3001: Wage index

IRWIND = IRWINDPGDPM * IRPGDPM

'3002: Active population, thousands

IRPOPA = IRPOPAPOP * IRPOP

'3003: Unemployment, thousands

IRUNEMP = IRPOPA - IREMP

'3004: Unemployment rate, percent

IRUNEMPR = IRUNEMP / IRPOPA * 100

'3101: Active population ratio

IRPOPAPOP = - 0.335100049170576 + 1.09508062161122 * IRPOPAPOP(-1) + 0.000226764218467866 * IRYEAR + 0.000226764218467866 * IRD66

'3102: Population, thousands

IRPOP = 752.858231454658 + 1.00656839258299 * IRPOP(-1)

'3103: Real wage index

IRWINDPGDPM = IRWINDPGDPM(-1) - 0.0104607095774733 * (IREMP - IREMP(-1)) + 0.000388807999265757 * (IRGDPM - IRGDPM(-1)) + 13.8937284860481 * IRD7579 + 16.682940458345 * IRD7880

'3104: Employment, thousands

IREMP = IREMP(-1) + 15.2318146460452 * (IRWIND - IRWIND(-1)) + 0.0153834643670234 * IRPOPA + 681.554737445635 * IRD66 + 373.298130746925 * IRD76

Chapter Four

Evaluation of the Model

4-1 Model's Evaluating Criteria

After estimation of econometric models, we usually use some statistics and measures to evaluate its performance. We used the following conventional model performance evaluation statistics:

Y_t	Actual endogenous variable
$\hat{y}_t$	Simulated endogenous variable resulted from model solution for an arbitrary in-sample period.
e_t	Difference between simulated and real variables ($\hat{y}_t$-y_t)
N	Number of observations in simulation
M	Number of applied non-zero observations in simulation.
L	Number of observations in simulation with positive actual value.
t	Year index.

$$\overline{Y} = \frac{\sum_{t=1}^{N} Y_t}{N}$$ Mean value of actual endogenous variable.

$$\overline{\hat{Y}} = \frac{\sum_{t=1}^{N} \hat{Y}_t}{N}$$ Mean value of endogenous simulated variable.

$$\overline{e} = \frac{\sum_{t=1}^{N} e_t}{N}$$ Mean value of endogenous variable simulated error.

$$Var(e) = \frac{\sum_{t=1}^{N} (e_t - \overline{e})^2}{N}$$ The simulation error variance.

$$Sdv(e) = \sqrt{Var(e)}$$ The simulation error standard deviation.

Max(e) Maximum simulation error

Med(e) Median of simulation error

Min(e) Minimum simulation error

$$Skw(e) = \frac{\sum_{t=1}^{N} (e_t - \overline{e})^3}{(N-1)[Var(e)]^{1.5}}$$ Simulation error skewness.

$$Kur(e) = \frac{\sum_{t=1}^{N} (e_t - \overline{e})^4}{(N-1)[Var(e)]^2}$$ Simulation error kurtosis.

$$Rms(e) = \sqrt{\frac{\sum_{t=1}^{N} e_t^{\,2}}{N}}$$ Simulation root mean squared error.

$$Mp(e) = \frac{100 \sum_{t=1}^{L} \left(\frac{e_t}{Y_t} \right)}{L}$$ Simulation mean percentage error.

$$Rmsp(e) = 100 \sqrt{\frac{\sum_{t=1}^{M} \left(\frac{e_t}{Y_t} \right)}{M}}$$

Simulation root mean squared percentage error.

$$MA(e) = \frac{\sum_{t=1}^{N} | e_t |}{N}$$ Mean absolute simulation error.

$$MAP(e) = \frac{100.\sum_{t=1}^{L} \left| \frac{e_t}{Y_t} \right|}{L}$$ Mean absolute simulation percentage error.

$$Cor(Y_t, \hat{Y}_t) = \frac{Cov(Y_t, \hat{Y}_t)}{\sqrt{Var(Y_t).Var(\hat{Y}_t)}}$$ Correlation between actual and simulated.

$$Cov(Y_t, \hat{Y}_t) = \frac{\sum_{t=1}^{N} (Y_t - \overline{Y}_t)\left(\hat{Y}_t - \overline{\hat{Y}}_t\right)}{N}$$ Actual and simulation covariance.

$$Theil - U = \frac{\sqrt{\frac{\sum_{t=1}^{N} e_t^{\ 2}}{N}}}{\sqrt{\frac{\sum_{t=1}^{N} Y_t^{\ 2}}{N}} + \sqrt{\frac{\sum_{t=1}^{N} \hat{Y}_t^{\ 2}}{N}}}$$ Theil-U inequality statistics.

$$Theil - U - Bias = \frac{N.\left(\overline{\hat{Y}} - \overline{Y}\right)^2}{\sum_{t=1}^{N} (\hat{Y}_t - Y_t)^2}$$

Theil-U- bias proportion inequality statistics.

$$Theil - U - Var = \frac{[Sdv(\hat{Y}) - Sdv(Y)]^2}{\sum_{t=1}^{N} (\hat{Y}_t - Y_t)^2}$$

Theil-U- variance proportion inequality statistics.

$$Theil - U - Cov = \frac{2N[1 - Cor\left(Y_t, \hat{Y}_t\right)]Sdv(\hat{Y}).Sdv(Y)}{\sum_{t=1}^{N} e_t^{\ 2}}$$

Theil-U-Covariance proportion inequality statistics.

4-2 Evaluations of Ex-Post Simulation

This model has been evaluated after a dynamic simulation for the period of 1959-2003 with the above mentioned criteria. All of calculations were presented in the following tables. In these tables, the rows show two hundred endogenous variables. In the first column in the left side of the table we showed the arrangement number of the above variables and in the next column the name of the related variables are shown. In the next column, the number of observations and the observations with nonzero value are inserted. The next columns are respectively to show mean of actual, mean of simulated, mean of simulated error, VAR (error), SDV (error), median (error), max (error), min (error), skewness (error), kurtosis (error), RMS Error, mean percent error, RMS percent error, mean absolute error, mean absolute percent error, Corr (act,sim), Cov (act,sim), Theil U-Stat., Theil U-Bias, Theil U-Var, Theil U-Cov. statistics were showed in the table. Examining these statistics would show the model explanatory power for the 1959-2003 sample period.

No.	Actual	Mean actual	Mean simulated	Mean error	VAR (error)	SDV (error)
1	IRAD	359540	263755.2	-95784.8	1.641E+11	405079.39
2	IRADV	198658.5	189260.1	-9398.31	1.457E+09	38168.672
3	IRAS	359540	263755.2	-95784.8	1.641E+11	405079.39
4	IRASV	198658.5	189260.1	-9398.31	1.457E+09	38168.672
5	IRBOPD	522.3511	-146.853	-669.204	5003912.6	2236.9427
6	IRBOPDC	4705.976	-3379.48	-8085.45	158477021	12588.766
7	IRBOPEOD	-367.711	-436.623	-68.9119	242307.48	492.24738
8	IRBOPEODC	-5610.77	-6335.58	-724.813	1321236.5	1149.4505
9	IRBOT	-4796.37	-7450.2	-2653.84	90028127	9488.3153
10	IRBOTV	3792.503	-1813.42	-5605.92	166999964	12922.847
11	IRC	92781.19	97709.64	4928.443	111750291	10571.201
12	IRCAD	1250.489	650.197	-600.292	7134345.6	2671.0196
13	IRCADC	20969.77	13609.13	-7360.64	153731937	12398.868
14	IRCCA	28199.61	28439.9	240.2964	4358218	2087.6346
15	IRCCAV	16257.45	12761.8	-3495.64	24431646	4942.8379
16	IRCPI	34.69289	32.935	-1.75789	43.8969	6.62547
17	IRCUV	5865.053	6604.851	739.7972	6940534.3	2634.4894
18	IRCUVPGDPM	16699.87	16411.72	-288.158	16584509	4072.4082
19	IRCV	57014.28	60028.45	3014.174	257556505	16048.567

No.	Actual	Mean actual	Mean simulated	Mean error	VAR (error)	SDV (error)
20	IRDDV	19265.76	19501.25	235.4863	24730044	4972.9312
21	IRDDVPGDPM	28121.89	29326.57	1204.679	12684630	3561.5488
22	IRDIS	15117.91	10520.37	-4597.54	143621697	11984.227
23	IRDISV	9105.618	22825.48	13719.86	789310337	28094.667
24	IREENOIL	1146.108	1314.097	167.9884	350223.18	591.79657
25	IREM	1723.701	1932.674	208.973	666177.4	816.19691
26	IREMP	10770.17	10671.42	-98.75	168019.98	409.9024
27	IRFYSBD	-653.979	-626.965	27.01357	128443.39	358.39
28	IRFYSBDC	-10676.1	-9564	1112.107	577809.04	760.13751
29	IRG	31498.86	33381.32	1882.46	4587794.6	2141.9138
30	IRGBDV	-2103.41	9123.42	11226.83	580921004	24102.303
31	IRGBDVC	11727.93	-46951	-58678.9	1.318E+10	114823.31
32	IRGDEM	197308.4	202451.9	5143.432	244660627	15641.631
33	IRGDEMV	118764.7	118029.6	-735.145	516109239	22718.038
34	IRGDIM	204752.3	130554.2	-74198.1	1.624E+11	403040.32
35	IRGDIMV	118764.7	118029.6	-735.145	516109239	22718.038
36	IRGDPF	192965.1	199872.6	6907.519	199341270	14118.827
37	IRGDPFV	117841.1	117159	-682.026	582368542	24132.313
38	IRGDPM	197308.4	202451.9	5143.432	244660627	15641.631
39	IRGDPMV	118764.7	118029.6	-735.145	516109239	22718.038
40	IRGDPNF	152114	156129.4	4015.389	133652779	11560.83
41	IRGDPNFV	96593.87	99654.28	3060.418	675285269	25986.252
42	IRGEFIDC	4999.901	4999.901	0.00011	0	0.00016
43	IRGESV	3482.426	4203.977	721.5518	1110170.8	1053.6464
44	IRGEV	30501.54	31223.09	721.5524	1110177	1053.6494
45	IRGNIM	204432.6	130389.6	-74043	1.624E+11	403042.81
46	IRGNIMV	117773.3	116390.8	-1382.5	474578059	21784.813
47	IRGNPM	196988.7	202287.2	5298.541	246914500	15713.513
48	IRGNPMV	117773.3	116390.8	-1382.5	474578059	21784.813
49	IRGNS	75492.13	478.0784	-75014	1.645E+11	405639.19
50	IRGNSV	44075.97	33355.79	-10720.2	345507031	18587.819
51	IRGRMV	4339.247	15093.2	10753.96	501177484	22386.994
52	IRGROILV	10158.62	10732.77	574.1552	11390265	3374.9466
53	IRGRSV	3482.426	4203.977	721.5518	1110170.8	1053.6464
54	IRGRTDV	3819.364	2606.536	-1212.83	5798907.3	2408.092
55	IRGRTIV	3386.873	4498.415	1111.542	4679584.8	2163.2348
56	IRGRTV	7206.238	7104.951	-101.287	4494869.1	2120.1106
57	IRGRV	28398.13	40346.51	11948.38	610393530	24706.144
58	IRGV	16081.16	8565.765	-7515.39	214762617	14654.781
59	IRI	62706.86	68290.77	5583.909	141723649	11904.774
60	IRIG	21926.33	23247.23	1320.9	8696613.2	2949.0021
61	IRIGV	12131.44	10719.65	-1411.79	23278214	4824.7501
62	IRII	10457.49	11699.83	1242.345	44865455	6698.168
63	IRIIV	8503.74	8384.71	-119.029	24490187	4948.7561
64	IRINFCPI	0.14221	0.15135	0.00914	0.02874	0.16952
65	IRINFWPI	0.14189	0.14256	0.00067	0.01295	0.11378
66	IRINPUT	103352	74011.07	-29341	353981957	18814.408
67	IRINPUTV	56510.39	35324.37	-21186	1.563E+09	39540.112
68	IRIP	40780.52	45043.53	4263.007	97198935	9858.952
69	IRIPV	20639.74	17703.67	-2936.07	15285256	3909.6363

No.	Actual	Mean actual	Mean simulated	Mean error	VAR (error)	SDV (error)
70	IRIRNB	33.43458	34.32851	0.89392	31.35844	5.59986
71	IRIT	7484.884	4217.617	-3267.27	4612824	2147.7486
72	IRITV	3109.742	1915.199	-1194.54	9257777.6	3042.6596
73	IRIV	32771.18	28423.32	-4347.86	36287817	6023.937
74	IRK	683472	707827.7	24355.73	7.029E+09	83836.389
75	IRKADC	-10653	-10653	0	0	0
76	IRKV	466164.4	355903.7	-110261	2.641E+10	162503.24
77	IRM	51435.58	59189.93	7754.352	215748112	14688.367
78	IRM2NFAD	4710.948	-2422.69	-7133.64	131938424	11486.445
79	IRM2NFAV	4338.231	-15749.7	-20087.9	2.996E+09	54731.232
80	IRM2NGGV	38862.17	-20536.7	-59398.9	1.387E+10	117751.15
81	IRM2NGSV	-18361.6	-31866.9	-13505.3	654200926	25577.352
82	IRM2NGSVPGDPM	-40241.6	-84088.7	-43847.1	576649460	24013.527
83	IRM2NGV	20500.53	-52403.6	-72904.2	2.047E+10	143067.14
84	IRM2NPV	40296.21	51323.02	11026.81	354225971	18820.892
85	IRM2NPVPGDPM	63571.92	81271.39	17699.48	662753468	25743.999
86	IRM2NWV	-9280.56	76536.45	85817.01	3.705E+10	192476.34
87	IRM2V	55854.41	59706.12	3851.718	191826501	13850.144
88	IRMFY	4511.859	4447.588	-64.2711	1090678.7	1044.3556
89	IRMFYSD	1583.423	1558.998	-24.4256	125001.07	353.55491
90	IRMFYV	2430.121	3393.362	963.2413	12570016	3545.4218
91	IRMG	46429.29	53010.67	6581.386	171500250	13095.81
92	IRMGD	11077.52	13010.18	1932.659	13268467	3642.5908
93	IRMGDCIFP	126.4949	144.1644	17.66956	1236.1801	35.15935
94	IRMGV	20181.47	30949.13	10767.66	612156955	24741.806
95	IRMNFS	5006.29	6179.257	1172.967	20612791	4540.1312
96	IRMNFSD	1271.546	1875.069	603.523	1547361.2	1243.9298
97	IRMNFSDCIFP	13.92817	18.5937	4.66553	184.9566	13.59987
98	IRMNFSV	3201.861	4957.052	1755.191	25518102	5051.5445
99	IRMSD	2854.969	3434.066	579.0975	1752499.3	1323.82
100	IRMV	23383.33	35906.18	12522.85	879969992	29664.288
101	IRNFSBD	-871.626	-1589.54	-717.918	1921584.6	1386.2123
102	IRNFSBDC	-12859	-25330	-12471	202459026	14228.81
103	IRNFY	-319.753	-164.632	155.1212	2254686.5	1501.5613
104	IRNFYV	-991.458	-1638.82	-647.364	4317618.1	2077.8879
105	IRNIT	4343.327	2579.235	-1764.09	7802445	2793.2857
106	IRNITV	923.6839	870.5748	-53.1091	2825108.7	1680.806
107	IRNNIF	171889.7	99370.44	-72519.2	1.621E+11	402631.41
108	IRNNIFV	100592.1	102758.4	2166.261	557681938	23615.29
109	IRNNS	47292.52	-27961.8	-75254.3	1.642E+11	405238.41
110	IRNNSV	27818.52	20593.99	-7224.53	217664012	14753.441
111	IRNTRD	378.7378	-98.5028	-477.241	525787.28	725.11191
112	IRNTRDC	3890.609	496.7809	-3393.83	39359438	6273.7101
113	IROLV	3265.857	2545.857	-720	23328000	4829.9068
114	IROLVC	20902.27	20182.27	-719.996	23327933	4829.8999
115	IROUTPUT	296317.2	273883.7	-22433.4	520995236	22825.32
116	IROUTPUTV	174351.4	152483.4	-21868	2.209E+09	47002.603
117	IRPA	0.36548	0.34286	-0.02262	0.00683	0.08265
118	IRPBOT	0.05712	-0.04273	-0.09985	6.2237	2.49473
119	IRPC	0.35479	0.338	-0.01679	0.00858	0.09261

No. Actual	Mean actual	Mean simulated	Mean error	VAR (error)	SDV (error)
120 IRPCCA	0.33598	0.22462	-0.11135	0.0164	0.12804
121 IRPDIS	1.04948	6.91047	5.86099	308.38927	17.56102
122 IRPG	0.39219	0.19316	-0.19903	0.14321	0.37843
123 IRPGDEM	0.37423	0.34153	-0.03271	0.00684	0.08272
124 IRPGDIM	0.36622	0.35536	-0.01087	0.00856	0.09251
125 IRPGDPF	0.37423	0.34153	-0.03271	0.00684	0.08272
126 IRPGDPM	0.37423	0.34153	-0.03271	0.00684	0.08272
127 IRPGDPNF	0.35686	0.34227	-0.01458	0.0041	0.06405
128 IRPGNIM	0.365	0.35182	-0.01318	0.00838	0.09152
129 IRPGNPM	0.37298	0.33862	-0.03436	0.00719	0.08479
130 IRPGNS	0.36024	0.21829	-0.14195	0.02706	0.16451
131 IRPI	0.3334	0.22096	-0.11244	0.0151	0.1229
132 IRPIG	0.34774	0.28693	-0.06081	0.02717	0.16484
133 IRPII	0.56763	0.50111	-0.06652	0.53659	0.73252
134 IRPINPUT	0.35545	0.27955	-0.07591	0.02236	0.14954
135 IRPIP	0.32667	0.19208	-0.13458	0.01344	0.11591
136 IRPIT	0.37422	0.34153	-0.0327	0.00684	0.08273
137 IRPK	0.35532	0.21531	-0.14001	0.02862	0.16919
138 IRPM	0.39579	0.43851	0.04272	0.0465	0.21564
139 IRPMFY	0.40502	0.56215	0.15713	0.22834	0.47785
140 IRPMG	0.39668	0.43088	0.0342	0.04354	0.20867
141 IRPMNFS	0.38861	0.49682	0.10821	0.07956	0.28206
142 IRPNFY	0.3828	0.74088	0.35808	1.28213	1.13231
143 IRPNIT	0.37423	0.34153	-0.0327	0.00684	0.08273
144 IRPNNIF	0.37035	0.72509	0.35474	5.68213	2.38372
145 IRPNNS	0.38072	0.25797	-0.12275	0.10124	0.31819
146 IRPOP	42489.36	42845.85	356.4918	4163844.5	2040.5501
147 IRPOPA	11992.78	8225.947	-3766.84	25737430	5073.2071
148 IRPOPAPOP	0.28436	0.21356	-0.0708	0.00518	0.07196
149 IRPOUTPUT	0.36783	0.32494	-0.04289	0.00959	0.09793
150 IRPSP	0.36577	0.19124	-0.17453	10.12772	3.18241
151 IRPSUB	0.37423	0.34153	-0.03271	0.00684	0.08272
152 IRPVAOIL	0.51465	0.3596	-0.15505	0.1431	0.37829
153 IRPX	0.45183	0.42661	-0.02523	0.00876	0.09359
154 IRPXFY	0.38001	0.46574	0.08573	0.08722	0.29532
155 IRPXNFS	0.3871	0.53684	0.14973	0.16799	0.40987
156 IRPXNOILG	0.4107	0.3776	-0.03309	0.03161	0.17778
157 IRPXOIL	0.49012	0.44807	-0.04204	0.00914	0.09559
158 IRPYD	0.35969	0.36479	0.0051	0.00538	0.07334
159 IRSBD	-1525.6	-2216.51	-690.905	2121331.5	1456.4792
160 IRSBDC	-23535.1	-34894	-11358.9	191675170	13844.68
161 IRSDV	30723.59	33600.03	2876.434	63157011	7947.1385
162 IRSDVPGDPM	49165.55	51087.1	1921.553	123227353	11100.782
163 IRSP	24511.14	25427.92	916.7808	44013923	6634.299
164 IRSPV	18511.32	22618.68	4107.355	169425981	13016.374
165 IRSUB	3141.558	1638.382	-1503.18	2152981.6	1467.3042
166 IRSUBV	2186.053	1044.625	-1141.43	4608500.7	2146.7419
167 IRTBD	2397.356	2965.209	567.8533	5350420.7	2313.0976
168 IRTBDC	40614.28	48006.39	7392.104	85943641	9270.5793
169 IRTOT	7443.9	-71897.7	-79341.6	1.63E+11	403698.13

No.	Actual	Mean actual	Mean simulated	Mean error	VAR (error)	SDV (error)
170	IRUNEMP	1222.61	-2445.48	-3668.09	24764810	4976.4254
171	IRUNEMPR	9.31794	-47.1121	-56.43	12882.359	113.50048
172	IRVAOIL	40851.13	43743.26	2892.131	11434343	3381.4706
173	IRVAOILV	21247.19	17504.73	-3742.45	110066568	10491.261
174	IRWIND	31.97945	53.29253	21.31308	2205.9866	46.96793
175	IRWINDPGDPM	81.53179	108.7226	27.19078	1208.9983	34.77065
176	IRWPI	33.144	24.86301	-8.28099	262.33415	16.19673
177	IRWPID	33.84333	28.69427	-5.14907	147.34179	12.13844
178	IRWPIM	29.86111	15.39317	-14.468	632.31273	25.14583
179	IRWPIX	41.3	15.0395	-26.2605	2225.0584	47.17052
180	IRX	46639.21	51739.73	5100.517	106664548	10327.853
181	IRXFY	4192.106	4282.956	90.8501	1109288.6	1053.2277
182	IRXFYSD	929.4446	932.0326	2.58798	50427.189	224.55999
183	IRXFYV	1438.663	1754.54	315.8766	2375768.6	1541.3528
184	IRXGD	13474.88	15975.39	2500.513	9793516.2	3129.4594
185	IRXGNOD	1471.464	2085.9	614.4355	1259365.4	1122.2145
186	IRXGNODOP	16.97739	20.84504	3.86765	165.8338	12.87765
187	IRXNFS	1357.197	1059.685	-297.512	793892.15	891.00626
188	IRXNFSD	399.9199	285.5246	-114.395	215708.75	464.44456
189	IRXNFSDOP	4.94229	3.2349	-1.70739	26.14676	5.11339
190	IRXNFSV	1989.535	3131.393	1141.859	15700776	3962.4205
191	IRXNOILG	6828.874	8655.96	1827.086	37008076	6083.4263
192	IRXNOILGV	6294.921	9479.104	3184.183	48431881	6959.3017
193	IRXOIL	38453.14	42024.08	3570.943	17650497	4201.2495
194	IRXOILB	908.7681	999.6872	90.9191	11441.992	106.96725
195	IRXOILD	12003.42	13889.49	1886.078	4640569.3	2154.1981
196	IRXOILV	18891.38	21482.27	2590.89	53399601	7307.5031
197	IRXSD	1329.364	1217.557	-111.807	259495.21	509.40672
198	IRXV	27175.84	34092.76	6916.929	311292867	17643.494
199	IRYD	117292.3	123137.6	5845.225	112870068	10624.033
200	IRYDV	75525.6	82647.13	7121.529	763555865	27632.515

No.	Actual	Median (error)	Max (error)	Min (error)	Skewness (error)	Kurtosis (error)
1	IRAD	-20731.3721	50311.3	-2723074	-6.19305	40.22119
2	IRADV	-623.46037	152329.7	-105546	0.57208	9.90294
3	IRAS	-20731.3721	50311.3	-2723074	-6.19305	40.22119
4	IRASV	-623.46037	152329.7	-105546	0.57208	9.90294
5	IRBOPD	-28.8549	3488.738	-8028.79	-1.23058	5.12388
6	IRBOPDC	-1314.467	5279.64	-34491.9	-1.10008	2.5972
7	IRBOPEOD	13.69492	1554.435	-1288.62	0.65382	5.01756
8	IRBOPEODC	-403.63	822.976	-3101.03	-0.81466	2.39739
9	IRBOT	-2064.62021	22230.57	-25814.5	-0.2536	3.62682
10	IRBOTV	-201.51127	7684.969	-57578.4	-2.31577	8.34177
11	IRC	3689.8501	26859.4	-20428.3	0.37599	2.8483
12	IRCAD	-7.71746	4777.359	-9583.23	-1.22143	5.39341
13	IRCADC	-1167.01	5907.58	-33447.3	-1.17654	2.69155
14	IRCCA	-131.16299	4966.53	-2708.24	0.76838	2.65441

No.	Actual	Median (error)	Max (error)	Min (error)	Skewness (error)	Kurtosis (error)
15	IRCCAV	-1664.42854	0	-22077.4	-2.22333	7.3121
16	IRCPI	0.19368	15.9257	-20.9571	-1.38523	6.06765
17	IRCUV	45.4008	14590.97	-3369.07	3.75828	18.87012
18	IRCUVPGDPM	1.49224	7611.571	-13757.6	-0.93323	5.07263
19	IRCV	997.81787	80352.6	-26045.6	2.84135	14.22282
20	IRDDV	42.31412	29703.6	-8214.74	4.50514	28.37361
21	IRDDVPGDPM	724.16337	10014.45	-5960.95	0.42098	2.89723
22	IRDIS	-2229.31098	19096.16	-33961	-0.648	3.23966
23	IRDISV	4711.72847	154547.2	-2273.42	3.42836	15.75102
24	IREENOIL	18.18861	3348.548	-421.107	3.89322	20.04003
25	IREM	-5.47712	4427.33	-421.773	3.80855	18.44564
26	IREMP	35.164	694.4429	-1003.78	-0.9304	2.96095
27	IRFYSBD	88.60074	901.1836	-961.797	-0.69739	4.06246
28	IRFYSBDC	927.73663	2787.018	0	0.59246	2.28263
29	IRG	1568.40538	6332.864	-424.558	0.78772	2.41969
30	IRGBDV	1214.9699	127442.8	0	3.15586	13.74467
31	IRGBDVC	-7851.533	0	-505207	-2.54043	8.90156
32	IRGDEM	304.21025	39763.9	-18700.4	0.77331	2.64803
33	IRGDEMV	479.37505	119385.7	-53170	2.77338	18.88478
34	IRGDIM	-7765.45657	82394.53	-2698620	-6.26971	40.86141
35	IRGDIMV	479.37505	119385.7	-53170	2.77338	18.88478
36	IRGDPF	3267.42887	42573	-17653.4	0.81298	3.11657
37	IRGDPFV	511.93889	127493.1	-52986	2.86093	19.08505
38	IRGDPM	304.21025	39763.9	-18700.4	0.77331	2.64803
39	IRGDPMV	479.37505	119385.7	-53170	2.77338	18.88478
40	IRGDPNF	2501.23077	35068.3	-17500.9	0.7833	3.54703
41	IRGDPNFV	473.46737	146900.7	-37488.8	3.91687	22.07172
42	IRGEFIDC	0.00022	0.0003	-0.00041	-1.46269	5.3121
43	IRGESV	214.0183	3904.08	-2.94802	1.53032	4.02136
44	IRGEV	214.018	3904.1	-2.94802	1.53033	4.02139
45	IRGNIM	-6916.79224	82040.92	-2698128	-6.26727	40.83947
46	IRGNIMV	479.85736	108585.2	-54491.9	2.18023	16.24775
47	IRGNPM	270.56585	39875.9	-22854.5	0.65429	2.72124
48	IRGNPMV	479.85736	108585.2	-54491.9	2.18023	16.24775
49	IRGNS	-5839.65747	66098.69	-2715556	-6.26552	40.81199
50	IRGNSV	-4502.2247	3960.477	-91004.9	-2.67653	10.34406
51	IRGRMV	1002.262	109002.5	-1.10022	2.77661	10.72254
52	IRGROILV	0.472	15537.9	-3728.13	3.72104	16.7989
53	IRGRSV	214.0183	3904.08	-2.94802	1.53032	4.02136
54	IRGRTDV	-84.4747	62.2729	-7945.49	-1.87094	4.96565
55	IRGRTIV	105.8189	9568.19	-381.88	2.46945	8.57545
56	IRGRTV	51.7025	5080.71	-7593.7	-1.66458	7.94344
57	IRGRV	1424.1	128239.7	0	3.00139	12.67806
58	IRGV	-658.55819	16.97955	-56570.6	-2.05409	6.05733
59	IRI	1354.69268	32488.21	-16588.5	0.48241	2.39846
60	IRIG	723.22	9112.858	-3119.87	0.8423	3.02445
61	IRIGV	-2.89014	2125.845	-17983.2	-2.73836	9.17845
62	IRII	246.303	15068.57	-12478.4	0.28173	2.3553
63	IRIIV	18.05512	14926.93	-11070.3	0.72552	5.62072
64	IRINFCPI	-0.02776	0.64156	-0.23921	1.33414	5.7091

No.	Actual	Median (error)	Max (error)	Min (error)	Skewness (error)	Kurtosis (error)
65	IRINFWPI	-0.02187	0.28083	-0.19473	0.39832	2.53222
66	IRINPUT	-33296.4929	0	-60732.5	0.17849	1.66159
67	IRINPUTV	-1710.2058	346.3943	-126615	-1.77118	4.51729
68	IRIP	1962.29302	28008.95	-14862.9	0.35251	2.65108
69	IRIPV	-4024.528	6731.66	-12810.6	-0.03928	3.31479
70	IRIRNB	0.89955	21.85164	-11.357	0.86082	6.56508
71	IRIT	-3261.919	1748.38	-7145.27	0.23108	2.15184
72	IRITV	-124.5001	320.5	-15300.7	-3.39364	14.15676
73	IRIV	-3680.962	5601.32	-26674	-1.64309	6.28595
74	IRK	-10022.6757	240462.7	-63313.3	1.39512	3.61438
75	IRKADC	0	0	0	3.04427	11.40765
76	IRKV	-46185.8435	0	-701983	-2.16724	7.16765
77	IRM	2420.53369	46699.9	-27252	0.63271	3.42313
78	IRM2NFAD	-260.90114	3917.386	-32420	-1.22462	2.93307
79	IRM2NFAV	-17.622	276.0776	-258000	-3.69286	16.09275
80	IRM2NGGV	-7851.533	0	-537607	-2.62709	9.50407
81	IRM2NGSV	-4542.847	0	-126693	-3.03596	12.27113
82	IRM2NGSVPGDPM	-44700.9063	0	-90380	0.13621	2.10678
83	IRM2NGV	-13162.69	0	-664300	-2.70023	9.99426
84	IRM2NPV	1723.778	71296.3	-361.374	1.66108	4.47194
85	IRM2NPVPGDPM	14102.53618	68955.39	-16735.8	0.52813	2.00864
86	IRM2NWV	11710.281	957169.7	0	3.27259	13.63707
87	IRM2V	230.833	78646.4	-3333.6	4.40759	22.15535
88	IRMFY	0	2678.269	-3791.07	-0.79664	5.93627
89	IRMFYSD	0	736.751	-1362.8	-0.849	6.02455
90	IRMFYV	26.12739	19402.14	-1228.64	4.05222	19.35003
91	IRMG	2615.80657	43520.21	-22122.4	0.89438	3.80651
92	IRMGD	345.07	12286.53	-3646.78	1.26734	4.0384
93	IRMGDCIFP	7.02288	116.8421	-59.3938	0.89438	3.80651
94	IRMGV	215.89862	116957	-5735.72	2.70034	10.21266
95	IRMNFS	-319.60008	16444.13	-5129.58	1.89111	6.03274
96	IRMNFSD	0	3984.431	-1027.85	1.52337	4.52738
97	IRMNFSDCIFP	0	44.78278	-16.7402	1.32932	4.34831
98	IRMNFSV	-0.51822	27455.43	-2536.04	3.62178	17.101
99	IRMSD	37.9684	4080.673	-2075.6	1.15923	4.10198
100	IRMV	186.19854	144412.5	-7541.67	2.84149	11.2297
101	IRNFSBD	-202.62	795.5814	-4652.83	-1.71756	4.84995
102	IRNFSBDC	-8924.32763	3822.119	-32341.9	-0.17692	1.23271
103	IRNFY	332.99847	2717.27	-4807.29	-1.71828	6.64568
104	IRNFYV	-11.77517	1017.443	-10801.1	-3.63418	16.16728
105	IRNIT	-1853.43361	5162.259	-6010.74	0.65959	2.84349
106	IRNITV	-21.90532	4492.35	-8106.95	-1.91049	14.00982
107	IRNNIF	-5282.86828	87421.17	-2694672	-6.27291	40.88594
108	IRNNIFV	1271.3705	131038.2	-36535.9	3.3505	20.76729
109	IRNNS	-5487.99111	66953.72	-2713685	-6.26911	40.84269
110	IRNNSV	-2907.47446	5611.339	-76658.8	-3.11282	13.52133
111	IRNTRD	-0.11342	0.2356	-1907.29	-1.00249	2.23193
112	IRNTRDC	0.04295	1.64417	-21475.8	-1.71603	4.512
113	IROLV	0	0	-32400	-6.41006	42.06667
114	IROLVC	0	0.05	-32400	-6.41006	42.06667

No.	Actual	Median (error)	Max (error)	Min (error)	Skewness (error)	Kurtosis (error)
115	IROUTPUT	-16985.2114	16262.2	-66544	-0.45831	1.83893
116	IROUTPUTV	-171.87064	16024.6	-179601	-1.95198	5.46837
117	IRPA	0.00255	0.21679	-0.33512	-1.39243	7.84433
118	IRPBOT	-0.00018	7.09361	-11.9182	-1.6312	14.4768
119	IRPC	0.01511	0.09272	-0.33256	-2.19089	6.57586
120	IRPCCA	-0.06681	0	-0.53964	-2.2057	6.63956
121	IRPDIS	0.24034	89.36713	-3.97329	3.42545	14.49739
122	IRPG	-0.01684	0.004	-1.38842	-1.89656	5.27929
123	IRPGDEM	0.00415	0.0189	-0.33212	-2.04244	6.12759
124	IRPGDIM	0.00656	0.30301	-0.33114	-0.33659	7.30976
125	IRPGDPF	0.00415	0.0189	-0.33212	-2.04244	6.12761
126	IRPGDPM	0.00415	0.0189	-0.33212	-2.04244	6.12759
127	IRPGDPNF	0.00705	0.1582	-0.1876	-1.20755	5.30699
128	IRPGNIM	0.00663	0.28118	-0.33427	-0.6165	6.97872
129	IRPGNPM	0.00346	0.01766	-0.33526	-2.02583	5.98226
130	IRPGNS	-0.07798	0	-0.69465	-1.84226	5.64495
131	IRPI	-0.0722	0	-0.54636	-2.18861	6.94121
132	IRPIG	0	0.14553	-0.5742	-1.86989	5.55892
133	IRPII	-0.00069	2.06146	-4.21938	-3.55456	25.14844
134	IRPINPUT	0.00188	0.01576	-0.52366	-1.69455	4.41465
135	IRPIP	-0.10426	0	-0.58913	-2.10015	7.6361
136	IRPIT	0.00413	0.01887	-0.33214	-2.04244	6.12773
137	IRPK	-0.07495	0	-0.67898	-2.00094	5.85093
138	IRPM	0.00227	1.25559	-0.33618	3.91714	23.27008
139	IRPMFY	0.0057	2.28212	-0.19313	3.22493	12.92721
140	IRPMG	0.00239	1.19851	-0.38798	3.6642	22.78372
141	IRPMNFS	0.0084	1.56247	-0.09863	3.54587	17.11452
142	IRPNFY	0.01197	5.13597	-1.42241	2.52682	9.97981
143	IRPNIT	0.00408	0.01885	-0.33218	-2.04265	6.12898
144	IRPNNIF	0.01176	15.97942	-0.29934	6.39658	41.95439
145	IRPNNS	-0.0453	0.87644	-0.92647	0.26736	5.53778
146	IRPOP	278.32	3516.31	-2943.32	0.02038	1.65761
147	IRPOPA	-1343.057	257.837	-18385.5	-1.38531	3.87215
148	IRPOPAPOP	-0.04107	0	-0.27662	-1.3859	3.93249
149	IRPOUTPUT	0.00326	0.01897	-0.37814	-1.93936	5.55432
150	IRPSP	0.03128	7.69096	-19.6366	-4.85297	32.63743
151	IRPSUB	0.00415	0.0189	-0.33212	-2.04243	6.12751
152	IRPVAOIL	-0.00158	0.02088	-1.50655	-2.52547	7.93753
153	IRPX	-0.00023	0.29819	-0.39596	-1.32349	11.46092
154	IRPXFY	0.00366	1.54759	-0.12226	3.60772	16.07359
155	IRPXNFS	0.00464	1.84137	-0.49922	2.67526	10.63578
156	IRPXNOILG	-0.00983	0.78845	-0.5722	1.06603	13.72031
157	IRPXOIL	-0.00125	0.00004	-0.42617	-2.57935	8.79087
158	IRPYD	0.01785	0.25852	-0.19396	-0.24128	6.27586
159	IRSBD	-374.984	1258.363	-4846.28	-1.6077	4.75308
160	IRSBDC	-8476.29	4873.57	-31249.1	-0.1539	1.23577
161	IRSDV	128.5694	41117.7	-1510.09	3.60763	15.94693
162	IRSDVPGDPM	-636.05511	24900.14	-15070.8	0.67405	2.37299
163	IRSP	2063.08028	12204.55	-14239.8	-0.46743	2.48046
164	IRSPV	299.47153	74580.6	-5625.83	4.03778	20.60472

No.	Actual	Median (error)	Max (error)	Min (error)	Skewness (error)	Kurtosis (error)
165	IRSUB	-1117.72977	186.8274	-5185.69	-0.68325	2.44954
166	IRSUBV	-35.35535	29.9587	-8511.77	-1.8813	5.59324
167	IRTBD	-4.6504	5937.26	-6806.65	-0.47551	4.46704
168	IRTBDC	6551.47	25553.4	-4838.73	0.40102	1.66718
169	IRTOT	-13344.6589	82184.95	-2710722	-6.28967	41.0277
170	IRUNEMP	-1578.0995	187.2583	-19080	-1.59013	4.65311
171	IRUNEMPR	-14.67505	2.31005	-595.853	-3.19028	13.69023
172	IRVAOIL	2256.25281	9813.519	-1261.41	0.57925	1.89233
173	IRVAOILV	23.005	2026.267	-48030	-3.16934	12.50708
174	IRWIND	3.18875	215.5242	-0.01301	2.9005	10.77632
175	IRWINDPGDPM	24.49658	82.99468	-20.5689	0.17389	1.4525
176	IRWPI	-0.1852	0.73213	-56.2	-1.81977	4.86172
177	IRWPID	0.35078	3.0644	-43.9391	-1.98822	5.59331
178	IRWPIM	-1.88479	0.0172	-86.1646	-1.74731	4.59385
179	IRWPIX	-0.79026	0	-170.286	-1.91037	5.32391
180	IRX	1005.95484	25812.5	-9497.38	0.74753	2.25656
181	IRXFY	142.203	1503.64	-3184.69	-0.98738	3.91725
182	IRXFYSD	50.177	438.9201	-548.391	-0.48181	2.80456
183	IRXFYV	15.55457	8601.02	-1204.97	4.11665	20.79869
184	IRXGD	1332.37	9862.64	-721.985	0.82234	2.35656
185	IRXGNOD	25.7657	3111.489	-592.611	1.01594	2.6586
186	IRXGNODOP	0.43377	29.57689	-16.7404	0.60554	2.29191
187	IRXNFS	-38.96226	1771.391	-1599.97	0.36602	2.43334
188	IRXNFSD	-21.8907	1069.445	-896.519	0.66115	3.29513
189	IRXNFSDOP	-0.2236	10.16582	-9.18205	0.36602	2.43334
190	IRXNFSV	0.99712	22726.42	-273.509	4.19119	21.34006
191	IRXNOILG	204.912	13972.19	-7908.2	0.60554	2.29191
192	IRXNOILGV	-2.47652	27384.59	-172.879	2.27951	7.23543
193	IRXOIL	2802.80613	12107.4	-1512.99	0.59762	1.89418
194	IRXOILB	71.3616	308.264	-38.522	0.59762	1.89418
195	IRXOILD	1012.56	6882.34	-129.374	0.86106	2.52456
196	IRXOILV	48.783	36723.1	-5.66722	3.84774	17.16266
197	IRXSD	-90.02	1032.333	-1036.54	0.4561	2.84351
198	IRXV	22.97105	86834.1	-43.0868	3.28608	13.68507
199	IRYD	4732.51866	31836.71	-21822	0.23845	3.51451
200	IRYDV	1523.28792	154933.1	-29719.7	3.89517	20.07788

No.	Actual	RMS error	Mean percent error	RMS percent error	Mean absolute error	MA percent error	Corr (act,sim)
1	IRAD	411846.6	-0.2538	1.05649	106122.5	0.27464	0.35708
2	IRADV	38894.75	0.10414	0.38611	16824.88	0.25835	0.99591
3	IRAS	411846.6	-0.2538	1.05649	106122.5	0.27464	0.35708
4	IRASV	38894.75	0.10414	0.38611	16824.88	0.25835	0.99591
5	IRBOPD	2310.963	NA	NA	1458.824	NA	0.65415
6	IRBOPDC	14843.51	NA	NA	9127.508	NA	0.00312
7	IRBOPEOD	491.6012	NA	NA	329.422	NA	0.94122
8	IRBOPEODC	1348.047	NA	NA	928.3989	NA	0.98273
9	IRBOT	9750.402	NA	NA	7141.727	NA	0.94317
10	IRBOTV	13954.04	NA	NA	6803.266	NA	-0.11143
11	IRC	11556.66	0.03691	0.09271	8307.525	0.07606	0.98939
12	IRCAD	2708.534	NA	NA	1690.612	NA	0.8323
13	IRCADC	14300.16	NA	NA	8421.26	NA	0.73636
14	IRCCA	2078.247	0.0075	0.12813	1641.613	0.08835	0.99483
15	IRCCAV	6009.014	-3.72697	5.61612	3495.645	3.72697	0.99592
16	IRCPI	6.78318	0.17426	0.37701	3.33062	0.25398	0.99443
17	IRCUV	2708.062	0.29454	0.56105	946.9121	0.35667	0.98678
18	IRCUVPGDPM	4037.202	0.02581	0.20501	2670.329	0.15591	0.92981
19	IRCV	16152.96	0.65305	0.98016	7084.953	0.67974	0.99458
20	IRDDV	4923.001	0.36586	0.6696	1620.289	0.40696	0.99475
21	IRDDVPGDPM	3722.096	0.05471	0.12149	2775.177	0.10625	0.98541
22	IRDIS	12710.92	NA	NA	8984.369	NA	0.60546
23	IRDISV	30983.94	NA	NA	13986.51	NA	0.98519
24	IREENOIL	608.819	-0.11985	1.23418	244.0734	0.58281	0.98892
25	IREM	833.6925	-0.47	1.39226	340.4201	0.6063	0.98439
26	IREMP	417.1783	-0.00458	0.03085	289.0556	0.02335	0.99365
27	IRFYSBD	355.4136	NA	NA	266.7782	NA	0.88639
28	IRFYSBDC	1342.293	NA	NA	1112.107	NA	0.99712
29	IRG	2833.637	0.04113	0.07258	1999.351	0.05507	0.99529
30	IRGBDV	26344.89	NA	NA	11226.83	NA	-0.51953
31	IRGBDVC	127807	NA	NA	58678.89	NA	-0.95862
32	IRGDEM	16299.65	0.00827	0.06114	11598.74	0.05041	0.99281
33	IRGDEMV	22476.22	0.27638	0.49734	8860.53	0.31136	0.99648
34	IRGDIM	405385.1	-0.34126	1.79814	86871.12	0.38651	0.22023
35	IRGDIMV	22476.22	0.27638	0.49734	8860.53	0.31136	0.99648
36	IRGDPF	15576.43	0.02056	0.05748	10986.34	0.04867	0.99457
37	IRGDPFV	23872.41	0.297	0.5295	9511.06	0.33217	0.99602
38	IRGDPM	16299.65	0.00827	0.06114	11598.74	0.05041	0.99281
39	IRGDPMV	22476.22	0.27638	0.49734	8860.53	0.31136	0.99648
40	IRGDPNF	12116.36	0.00881	0.06469	8614.978	0.05522	0.99566
41	IRGDPNFV	25877.5	0.30529	0.51731	9577.193	0.33766	0.99508
42	IRGEFIDC	0.00019	NA	NA	0.00015	NA	1
43	IRGESV	1267.335	2.00363	3.33771	721.7823	2.01706	0.99599
44	IRGEV	1267.337	0.09443	0.12751	721.7829	0.09753	0.99995
45	IRGNIM	405359.1	-0.33486	1.78943	86804.84	0.38293	0.21598
46	IRGNIMV	21585.72	0.28607	0.52115	8689.76	0.32216	0.99648

No.	Actual	RMS error	Mean percent error	RMS percent error	Mean absolute error	MA percent error	Corr (act,sim)
47	IRGNPM	16416.52	0.01165	0.06085	11462.3	0.04825	0.99199
48	IRGNPMV	21585.72	0.28607	0.52115	8689.76	0.32216	0.99648
49	IRGNS	408061	-1.07123	5.82702	83734.97	1.17652	0.12248
50	IRGNSV	21277.95	-2.66833	4.1159	11106.01	2.93753	0.99684
51	IRGRMV	24610.72	6.72728	7.60086	10754	6.73018	0.78327
52	IRGROILV	3386.267	-0.01519	0.1689	1143.086	0.11888	0.99826
53	IRGRSV	1267.335	2.00363	3.33771	721.7823	2.01706	0.99599
54	IRGRTDV	2672.264	0.04001	0.57342	1221.046	0.43492	0.97934
55	IRGRTIV	2410.626	0.8127	1.00329	1128.514	0.81418	0.98849
56	IRGRTV	2098.867	0.36472	0.57196	1002.255	0.42844	0.99035
57	IRGRV	27195.46	0.8034	0.95282	11948.38	0.8034	0.9892
58	IRGV	16323.95	-0.2498	0.37161	7520.869	0.3319	0.98365
59	IRI	13028.98	0.0615	0.17885	9430.056	0.13783	0.95773
60	IRIG	3201.27	0.0045	0.14282	2309.613	0.11566	0.98833
61	IRIGV	4975.347	0.08003	0.43816	2014.757	0.28693	0.9956
62	IRII	6738.833	NA	NA	5320.046	NA	0.85539
63	IRIIV	4894.908	NA	NA	2595.164	NA	0.97466
64	IRINFCPI	0.16788	NA	NA	0.12061	NA	0.3164
65	IRINFWPI	0.11251	NA	NA	0.09119	NA	0.61662
66	IRINPUT	34742.01	-0.25791	0.2963	29340.96	0.25791	0.9289
67	IRINPUTV	44469.37	-0.14263	0.41	21273.76	0.37579	0.98735
68	IRIP	10640.12	0.09671	0.2422	7804.006	0.18077	0.92449
69	IRIPV	4854.493	-5.14086	7.49842	3881.044	5.17484	0.99642
70	IRIRNB	5.60898	0.03119	0.13164	3.68509	0.10064	0.90679
71	IRIT	3896.839	-0.39218	0.4402	3368.436	0.40946	0.5896
72	IRITV	3237.126	-0.26055	0.35027	1209.765	0.30534	0.98262
73	IRIV	7374.64	-2.85518	4.12152	4977.049	2.86826	0.9976
74	IRK	86403.43	-0.02315	0.10139	54533.4	0.08329	0.99365
75	IRKADC	0	NA	NA	0	NA	1
76	IRKV	194879.2	-2.64337	3.76539	110260.7	2.64337	0.99398
77	IRM	16464.62	0.14749	0.32848	11349.75	0.21961	0.9049
78	IRM2NFAD	13412.5	NA	NA	8054.802	NA	0.29453
79	IRM2NFAV	57727.51	NA	NA	20154.18	NA	-0.95278
80	IRM2NGGV	130711.3	NA	NA	59398.89	NA	-0.82004
81	IRM2NGSV	28671.51	NA	NA	13505.28	NA	0.97785
82	IRM2NGSVPGDPM	49863.85	NA	NA	43847.1	NA	0.96686
83	IRM2NGV	159148.9	NA	NA	72904.17	NA	-0.94188
84	IRM2NPV	21632.03	0.45401	0.56438	11054.43	0.4679	0.99543
85	IRM2NPVPGDPM	31004.79	0.21413	0.40418	22773.36	0.31525	0.89977
86	IRM2NWV	208778.4	NA	NA	85817.01	NA	-0.9728
87	IRM2V	14226.72	0.30192	0.56861	4324.928	0.33981	0.99843
88	IRMFY	1034.685	0.0267	0.30549	689.8691	0.21298	0.97782
89	IRMFYSD	350.4567	0.09879	0.36364	247.8498	0.24725	0.96391
90	IRMFYV	3635.728	0.04959	2.47932	1163.66	1.30707	0.99515
91	IRMG	14525.97	0.16649	0.33654	9605.509	0.21316	0.89934
92	IRMGD	4087.638	0.14181	0.28973	2540.968	0.19328	0.93631

No.	Actual	RMS error	Mean percent error	RMS percent error	Mean absolute error	MA percent error	Corr (act,sim)
93	IRMGDCIFP	38.99901	0.14181	0.28973	25.78866	0.19328	0.91628
94	IRMGV	26730.06	0.03655	1.36186	11693.14	0.74072	0.99641
95	IRMNFS	4640.106	0.03552	1.6144	2805.257	0.99435	0.75342
96	IRMNFSD	1370.115	-0.40705	3.03991	840.5527	1.91576	0.78051
97	IRMNFSDCIFP	14.23424	-0.40705	3.0399	9.61862	1.91576	0.76516
98	IRMNFSV	5294.5	-1.03536	3.44006	2029.766	1.99159	0.99713
99	IRMSD	1431.401	0.1533	0.71562	921.4006	0.47555	0.88198
100	IRMV	31894.15	-0.05537	1.55393	13714.29	0.8001	0.99684
101	IRNFSBD	1547.349	NA	NA	889.3713	NA	0.68867
102	IRNFSBDC	18801.23	NA	NA	13782.02	NA	0.98411
103	IRNFY	1492.865	NA	NA	1021.565	NA	0.72436
104	IRNFYV	2154.24	NA	NA	745.0192	NA	0.98961
105	IRNIT	3277.358	NA	NA	2775.165	NA	0.42709
106	IRNITV	1662.874	NA	NA	728.9233	NA	0.75467
107	IRNNIF	404683.3	-0.38252	2.13268	84275.42	0.44177	0.18265
108	IRNNIFV	23451.69	0.65694	1.02032	10322.8	0.68778	0.99544
109	IRNNS	407715.7	NA	NA	82845.19	NA	0.12176
110	IRNNSV	16279.46	NA	NA	7960.398	NA	0.99363
111	IRNTRD	861.3139	NA	NA	477.3136	NA	0.46991
112	IRNTRDC	7071.269	NA	NA	3394.626	NA	-0.01785
113	IROLV	4829.907	NA	NA	720	NA	0.74317
114	IROLVC	4829.899	NA	NA	720.0022	NA	0.99353
115	IROUTPUT	31822.58	-0.07721	0.10251	23564.51	0.0796	0.98554
116	IROUTPUTV	51364.98	0.14062	0.4216	23227.46	0.28241	0.99411
117	IRPA	0.0848	0.21318	0.48769	0.04132	0.3303	0.99353
118	IRPBOT	2.46888	NA	NA	0.917	NA	-0.00052
119	IRPC	0.0931	0.61406	0.94534	0.05047	0.67635	0.99078
120	IRPCCA	0.16861	-3.76302	5.60713	0.11135	3.76302	0.99524
121	IRPDIS	18.32723	NA	NA	6.28453	NA	0.67354
122	IRPG	0.42384	-0.26477	0.40453	0.19995	0.36229	0.9751
123	IRPGDEM	0.08809	0.28016	0.53075	0.04126	0.34389	0.99607
124	IRPGDIM	0.09212	0.68567	2.15512	0.05053	0.78973	0.99221
125	IRPGDPF	0.08809	0.27991	0.53023	0.04126	0.34363	0.99607
126	IRPGDPM	0.08809	0.28016	0.53075	0.04126	0.34389	0.99607
127	IRPGDPNF	0.065	0.30089	0.51869	0.03373	0.34753	0.99546
128	IRPGNIM	0.09145	0.66377	2.03821	0.05024	0.76904	0.99267
129	IRPGNPM	0.09061	0.28348	0.54176	0.04224	0.34946	0.99616
130	IRPGNS	0.21589	-3.60519	5.26774	0.14195	3.60519	0.99189
131	IRPI	0.16556	-3.12122	4.56054	0.11244	3.12122	0.99399
132	IRPIG	0.17397	0.09345	0.44141	0.08679	0.32425	0.99203
133	IRPII	0.72739	NA	NA	0.2517	NA	0.90844
134	IRPINPUT	0.16622	0.13728	0.39357	0.08188	0.30825	0.99089
135	IRPIP	0.17678	-5.52923	8.27544	0.13458	5.52923	0.98943
136	IRPIT	0.08809	0.28361	0.53793	0.04127	0.3475	0.99607
137	IRPK	0.21816	-2.88172	4.12625	0.14001	2.88172	0.99372
138	IRPM	0.21746	-0.12772	1.26533	0.08645	0.60236	0.98118

No.	Actual	RMS error	Mean percent error	RMS percent error	Mean absolute error	MA percent error	Corr (act,sim)
139	IRPMFY	0.49795	0.07917	2.26838	0.19652	1.25863	0.98202
140	IRPMG	0.20916	-0.1171	1.23491	0.08217	0.57862	0.97999
141	IRPMNFS	0.29916	0.13299	1.64424	0.12647	1.00922	0.98925
142	IRPNFY	1.17553	NA	NA	0.52865	NA	0.85611
143	IRPNIT	0.0881	0.28372	0.53854	0.04127	0.34769	0.99607
144	IRPNNIF	2.38363	16.56804	105.6588	0.40941	16.66316	0.19741
145	IRPNNS	0.33773	-1.78276	12.68593	0.21407	5.4886	0.90638
146	IRPOP	2049	0.022	0.05771	1771.752	0.04763	0.99438
147	IRPOPA	6273.32	-0.22502	0.34556	3819.717	0.23252	-0.38221
148	IRPOPAPOP	0.10038	-0.24828	0.34253	0.0708	0.24828	0.10666
149	IRPOUTPUT	0.1059	0.23623	0.46992	0.05063	0.32522	0.9949
150	IRPSP	3.15169	NA	NA	0.73764	NA	0.26363
151	IRPSUB	0.08809	0.27991	0.53023	0.04126	0.34363	0.99607
152	IRPVAOIL	0.40492	0.24735	0.69524	0.15945	0.49572	0.98301
153	IRPX	0.09592	-0.04535	0.07831	0.03905	0.06633	0.99548
154	IRPXFY	0.30435	0	1.93815	0.11232	1.02002	0.9849
155	IRPXNFS	0.43206	0.2239	1.62356	0.19795	0.82018	0.95435
156	IRPXNOILG	0.17889	-0.615	1.90181	0.08174	0.92998	0.97276
157	IRPXOIL	0.10345	-0.04368	0.06567	0.04205	0.04559	0.99891
158	IRPYD	0.0727	0.77106	1.16078	0.04685	0.81172	0.99343
159	IRSBD	1597.354	NA	NA	988.982	NA	0.66718
160	IRSBDC	17788.78	NA	NA	13393	NA	0.98754
161	IRSDV	8368.237	0.27855	0.54033	3089.992	0.3264	0.99949
162	IRSDVPGDPM	11143.67	0.01545	0.18342	8057.046	0.15166	0.94892
163	IRSP	6623.92	NA	NA	5460.883	NA	0.94001
164	IRSPV	13510.42	NA	NA	4979.931	NA	0.98612
165	IRSUB	2089.181	-0.35721	0.43212	1522.924	0.38216	0.8835
166	IRSUBV	2410.176	-0.14819	0.52633	1143.667	0.45303	0.97367
167	IRTBD	2356.688	NA	NA	1618.091	NA	0.88029
168	IRTBDC	11776.12	NA	NA	8626.174	NA	0.99016
169	IRTOT	406995.9	NA	NA	83839.86	NA	-0.0902
170	IRUNEMP	6137.536	-1.9262	2.82526	3707.771	2.01599	-0.81632
171	IRUNEMPR	125.6202	-4.77155	10.54145	56.93246	4.85174	-0.39135
172	IRVAOIL	4420.935	0.08011	0.11841	3146.53	0.08576	0.98326
173	IRVAOILV	11028.44	0.30971	0.6862	4017.4	0.4643	0.98568
174	IRWIND	51.10002	0.44254	0.51119	21.31369	0.44577	0.98803
175	IRWINDPGDPM	43.83458	0.24626	0.50299	34.33807	0.40434	0.86947
176	IRWPI	18.02995	0.01658	0.31171	8.52485	0.24475	0.98066
177	IRWPID	13.06064	0.19022	0.42423	6.01427	0.30413	0.9867
178	IRWPIM	28.76774	-0.41315	0.54507	14.46871	0.41395	0.93338
179	IRWPIX	53.52781	-0.66052	0.68744	26.2605	0.66052	0.96336
180	IRX	11415.32	0.10421	0.21487	8136.641	0.16515	0.91295
181	IRXFY	1045.414	0.39668	0.89061	794.502	0.51683	0.98113
182	IRXFYSD	222.0659	0.57638	1.29711	174.6276	0.71669	0.97209
183	IRXFYV	1556.519	0.79315	2.9025	551.2073	1.83963	0.99133
184	IRXGD	3978.498	0.0896	0.21812	2704.756	0.18346	0.98149

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185	IRXGNOD	1268.428	0.04556	0.99433	852.6662	0.80232	0.96245
186	IRXGNODOP	13.30817	0.04556	0.99433	10.39392	0.80232	0.92078
187	IRXNFS	929.9266	-2.98784	7.07735	724.7431	3.37591	0.9674
188	IRXNFSD	473.288	-2.61937	5.29719	341.6173	3.1721	0.94905
189	IRXNFSDOP	5.33675	-2.61937	5.29719	4.15922	3.1721	0.90132
190	IRXNFSV	4081.141	-0.63491	10.79683	1247.603	4.87059	0.99682
191	IRXNOILG	6286.805	-0.11284	1.33904	4910.108	1.08299	0.90963
192	IRXNOILGV	7582.522	-0.17954	1.86766	3222.689	1.14376	0.99687
193	IRXOIL	5478.129	0.10866	0.16022	3880.017	0.11576	0.9745
194	IRXOILB	139.4776	0.11218	0.16841	98.78842	0.12085	0.97263
195	IRXOILD	2845.125	0.11218	0.16841	1906.233	0.12085	0.98561
196	IRXOILV	7676.305	0.05508	0.08718	2591.81	0.06033	0.99947
197	IRXSD	515.9743	0.27173	1.09556	403.9607	0.72887	0.95077
198	IRXV	18767.5	0.04694	0.15175	6930.232	0.11771	0.99961
199	IRYD	12022	0.03587	0.09863	9051.361	0.08168	0.99377
200	IRYDV	28236.57	0.81412	1.20226	10984.54	0.83581	0.9938

No.	Actual	Cov (act,sim)	Theil U-Stat.	Theil U-Bias	Theil U-Var	Theil U-Cov
1	IRAD	26311453029	0.45679	0.05409	0.38732	0.55859
2	IRADV	1.73366E+11	0.04227	0.05839	0.00113	0.94049
3	IRAS	26311453029	0.45679	0.05409	0.38732	0.55859
4	IRASV	1.73366E+11	0.04227	0.05839	0.00113	0.94049
5	IRBOPD	4279596.684	0.44319	0.08386	0.06879	0.84735
6	IRBOPDC	193686.6852	0.78367	0.29671	0.1417	0.56158
7	IRBOPEOD	1896840.793	0.16655	0.01965	0	0.98035
8	IRBOPEODC	22371778.17	0.08807	0.2891	0.27826	0.43264
9	IRBOT	729582871.7	0.171	0.07408	0.00108	0.92484
10	IRBOTV	-7718710.77	0.78166	0.1614	0.04785	0.79075
11	IRC	2780215860	0.05298	0.18187	0.37184	0.44629
12	IRCAD	17304888.33	0.29015	0.04912	0.00029	0.95059
13	IRCADC	203178555.6	0.29709	0.26494	0.02359	0.71147
14	IRCCA	294109089.3	0.03136	0.01337	0.27851	0.70812
15	IRCCAV	896957370.2	0.08995	0.33841	0.4583	0.20328
16	IRCPI	3515.33902	0.04958	0.06716	0.07766	0.85518
17	IRCUV	112191457.9	0.10927	0.07463	0.51555	0.40982
18	IRCUVPGDPM	98972486.42	0.10341	0.00509	0.07811	0.91679
19	IRCV	14215139139	0.06063	0.03482	0.37164	0.59353
20	IRDDV	1679572779	0.05416	0.00229	0.2659	0.73182
21	IRDDVPGDPM	346078748.6	0.05425	0.10475	0.15529	0.73996
22	IRDIS	107752323.6	0.34213	0.13083	0	0.86917
23	IRDISV	1221276427	0.37802	0.19608	0.76566	0.03826
24	IREENOIL	5481538.098	0.11415	0.07613	0.59242	0.33145
25	IREM	8828995.555	0.11833	0.06283	0.53434	0.40283

No.	Actual	Cov (act,sim)	Theil U-Stat.	Theil U-Bias	Theil U-Var	Theil U-Cov
26	IREMP	11290273.05	0.01856	0.05603	0.11509	0.82888
27	IRFYSBD	481890.6269	0.1819	0.00578	0.01634	0.97788
28	IRFYSBDC	68130227.25	0.05135	0.68643	0.09504	0.21852
29	IRG	286636982.3	0.03869	0.44133	0.22088	0.3378
30	IRGBDV	-61711156	0.92621	0.1816	0.29828	0.52011
31	IRGBDVC	-1707181706	0.99474	0.21079	0.36213	0.42708
32	IRGDEM	8462676673	0.037	0.09957	0.43889	0.46153
33	IRGDEMV	62952788147	0.04044	0.00107	0.11915	0.87978
34	IRGDIM	9113701885	0.61682	0.0335	0.57378	0.39272
35	IRGDIMV	62952788147	0.04044	0.00107	0.11915	0.87978
36	IRGDPF	8543569176	0.03585	0.19666	0.41851	0.38484
37	IRGDPFV	62002155826	0.04327	0.00082	0.12972	0.86946
38	IRGDPM	8462676673	0.037	0.09957	0.43889	0.46153
39	IRGDPMV	62952788147	0.04044	0.00107	0.11915	0.87978
40	IRGDPNF	7746100878	0.0341	0.10983	0.42968	0.4605
41	IRGDPNFV	41101581947	0.05729	0.01399	0.37951	0.60651
42	IRGEFIDC	13360222.13	0	0	0	1
43	IRGESV	77584293.69	0.06577	0.32415	0.28647	0.38937
44	IRGEV	4969916229	0.00823	0.32415	0.33636	0.33948
45	IRGNIM	8937591246	0.61746	0.03336	0.57175	0.39489
46	IRGNIMV	60927305662	0.03945	0.0041	0.07206	0.92383
47	IRGNPM	8374056738	0.03733	0.10417	0.39381	0.50202
48	IRGNPMV	60927305662	0.03945	0.0041	0.07206	0.92383
49	IRGNS	2274365400	0.82853	0.03379	0.77049	0.19571
50	IRGNSV	7519641217	0.11142	0.25383	0.64095	0.10522
51	IRGRMV	452939178.9	0.45291	0.19094	0.39522	0.41384
52	IRGROILV	678007559.1	0.06022	0.02875	0.76549	0.20576
53	IRGRSV	77584293.69	0.06577	0.32415	0.28647	0.38937
54	IRGRTDV	42723892.85	0.18028	0.20599	0.54157	0.25245
55	IRGRTIV	69529061.75	0.12949	0.21261	0.50866	0.27872
56	IRGRTV	223799972.3	0.06303	0.00233	0.00802	0.98965
57	IRGRV	5591688925	0.16306	0.19303	0.64185	0.16512
58	IRGV	581418595.7	0.29025	0.21196	0.7155	0.07254
59	IRI	1231787674	0.08717	0.18368	0.17576	0.64056
60	IRIG	196339259.4	0.06007	0.17025	0.37745	0.4523
61	IRIGV	540746819.8	0.09552	0.08052	0.72659	0.19289
62	IRII	125661595.9	0.20478	0.03399	0.0304	0.93561
63	IRIIV	456604167.7	0.10534	0.00059	0.00842	0.99099
64	IRINFCPI	0.00552	0.41714	0.00297	0.15061	0.84643
65	IRINFWPI	0.01013	0.29372	0.00003	0.00449	0.99547
66	IRINPUT	1549140877	0.17765	0.71324	0.09029	0.19647
67	IRINPUTV	8938720371	0.20743	0.22697	0.65719	0.11584
68	IRIP	509265389.4	0.1087	0.16052	0.1047	0.73477
69	IRIPV	2014596457	0.04963	0.3658	0.01945	0.61475
70	IRIRNB	142.39944	0.07762	0.0254	0.04406	0.93054

No.	Actual	Cov (act,sim)	Theil U-Stat.	Theil U-Bias	Theil U-Var	Theil U-Cov
71	IRIT	1879058.944	0.3164	0.70298	0.12475	0.17227
72	IRITV	26187924.97	0.27359	0.13617	0.77544	0.08839
73	IRIV	4634239538	0.04933	0.34759	0.24263	0.40978
74	IRK	2.63055E+11	0.04989	0.07946	0.47037	0.45017
75	IRKADC	101194446.9	0	0	0	1
76	IRKV	7.33022E+11	0.10208	0.32012	0.44612	0.23376
77	IRM	968646790.5	0.12806	0.22181	0.02714	0.75104
78	IRM2NFAD	14941027.43	0.72635	0.28288	0.31925	0.39787
79	IRM2NFAV	-509509134	0.99241	0.12109	0.25219	0.62672
80	IRM2NGGV	-3013163402	0.96043	0.2065	0.01065	0.78284
81	IRM2NGSV	1789084666	0.28115	0.22187	0.67951	0.09861
82	IRM2NGSVPGDPM	1157837218	0.34621	0.77323	0.19484	0.03193
83	IRM2NGV	-3626345583	0.9909	0.20984	0.19979	0.59036
84	IRM2NPV	9784593074	0.09876	0.25984	0.54822	0.19194
85	IRM2NPVPGDPM	1602274474	0.1839	0.32588	0.30276	0.37136
86	IRM2NWV	-3925663756	0.99727	0.16896	0.46576	0.36528
87	IRM2V	14407154753	0.05331	0.0733	0.70281	0.22389
88	IRMFY	22931388.21	0.07841	0.00386	0.02424	0.9719
89	IRMFYSD	1570971.956	0.08654	0.00486	0.03734	0.9578
90	IRMFYV	88438824.32	0.1816	0.07019	0.86461	0.0652
91	IRMG	739553274.9	0.12651	0.20528	0.0101	0.78462
92	IRMGD	69652009.84	0.13768	0.22355	0.20932	0.56713
93	IRMGDCIFP	5932.26886	0.12377	0.20528	0.08193	0.71279
94	IRMGV	3316955573	0.20806	0.16227	0.80423	0.0335
95	IRMNFS	22455623.21	0.29318	0.0639	0.25343	0.68267
96	IRMNFSD	1977234.506	0.30309	0.19403	0.21358	0.59239
97	IRMNFSDCIFP	213.24141	0.30179	0.10743	0.24654	0.64603
98	IRMNFSV	113714618.6	0.22637	0.1099	0.86672	0.02338
99	IRMSD	5969206.444	0.1752	0.16367	0.0566	0.77972
100	IRMV	4645189118	0.21037	0.15416	0.81689	0.02895
101	IRNFSBD	1218547.966	0.41482	0.21527	0.32458	0.46015
102	IRNFSBDC	359484987	0.33735	0.43998	0.52717	0.03285
103	IRNFY	2876146.359	0.37146	0.0108	0.00702	0.98218
104	IRNFYV	23955354.02	0.20779	0.0903	0.80128	0.10842
105	IRNIT	1052823.278	0.41014	0.28973	0.4473	0.26297
106	IRNITV	3134611.869	0.36599	0.00102	0.26194	0.73704
107	IRNNIF	6566468895	0.66323	0.03211	0.60903	0.35886
108	IRNNIFV	46266484428	0.04918	0.00853	0.22009	0.77138
109	IRNNS	1928377781	0.87491	0.03407	0.79859	0.16734
110	IRNNSV	3247311491	0.13038	0.19694	0.64587	0.15719
111	IRNTRD	227868.1083	0.57575	0.30701	0	0.69299
112	IRNTRDC	-223509.863	0.76967	0.23035	0.25977	0.50988
113	IROLV	27330973.59	0.35526	0.02222	0.16799	0.80979
114	IROLVC	1409757705	0.05627	0.02222	0.19011	0.78767
115	IROUTPUT	17324853862	0.0506	0.49696	0.00109	0.50195

No.	Actual	Cov (act,sim)	Theil U-Stat.	Theil U-Bias	Theil U-Var	Theil U-Cov
116	IROUTPUTV	1.19036E+11	0.06706	0.18125	0.2837	0.53505
117	IRPA	0.44829	0.05583	0.07116	0.11708	0.81176
118	IRPBOT	-0.00153	0.71326	0.00164	0.03185	0.96651
119	IRPC	0.36413	0.06664	0.03251	0.18522	0.78227
120	IRPCCA	0.32174	0.13236	0.43613	0.45554	0.10833
121	IRPDIS	45.12374	0.75498	0.10227	0.7675	0.13023
122	IRPG	0.29581	0.32687	0.22052	0.69538	0.08411
123	IRPGDEM	0.44976	0.05781	0.13785	0.40479	0.45737
124	IRPGDIM	0.43517	0.06105	0.01391	0.18071	0.80538
125	IRPGDPF	0.44976	0.05781	0.13785	0.40478	0.45736
126	IRPGDPM	0.44976	0.05781	0.13785	0.40479	0.45737
127	IRPGDPNF	0.39424	0.04514	0.05035	0.09908	0.85057
128	IRPGNIM	0.42718	0.06114	0.02079	0.22472	0.75449
129	IRPGNPM	0.44118	0.05999	0.14378	0.44195	0.41427
130	IRPGNS	0.38075	0.15682	0.43229	0.43414	0.13357
131	IRPI	0.30392	0.13322	0.46122	0.40462	0.13416
132	IRPIG	0.31736	0.13327	0.12217	0.70934	0.16849
133	IRPII	2.51801	0.20785	0.00836	0.03237	0.95927
134	IRPINPUT	0.33498	0.12489	0.20857	0.56859	0.22285
135	IRPIP	0.29993	0.14453	0.5796	0.21542	0.20497
136	IRPIT	0.44977	0.05782	0.13776	0.40485	0.45739
137	IRPK	0.31417	0.17154	0.41191	0.5047	0.08339
138	IRPM	0.76084	0.11135	0.03859	0.34437	0.61704
139	IRPMFY	1.27505	0.1983	0.09957	0.71212	0.18831
140	IRPMG	0.7467	0.10808	0.02673	0.27626	0.69701
141	IRPMNFS	0.84987	0.14461	0.13083	0.66275	0.20642
142	IRPNFY	2.74314	0.30934	0.09279	0.23993	0.66728
143	IRPNIT	0.44977	0.05782	0.1378	0.40485	0.45736
144	IRPNNIF	0.32439	0.72634	0.02215	0.51359	0.46426
145	IRPNNS	0.40524	0.22693	0.1321	0.13398	0.73392
146	IRPOP	196112399.8	0.0228	0.03027	0.44207	0.52766
147	IRPOPA	-2632753.81	0.2976	0.36054	0.1556	0.48386
148	IRPOPAPOP	0.00013	0.19687	0.49746	0.29236	0.21018
149	IRPOUTPUT	0.41461	0.07219	0.16398	0.45725	0.37877
150	IRPSP	0.57536	0.78292	0.00307	0.67334	0.32359
151	IRPSUB	0.44976	0.05781	0.13785	0.40477	0.45738
152	IRPVAOIL	1.08814	0.17597	0.14663	0.62398	0.22939
153	IRPX	0.9184	0.04541	0.06917	0.02461	0.90623
154	IRPXFY	0.77484	0.15363	0.07935	0.66408	0.25657
155	IRPXNFS	0.72922	0.21591	0.1201	0.50619	0.37371
156	IRPXNOILG	0.55185	0.1052	0.03423	0.00005	0.96573
157	IRPXOIL	1.21301	0.04316	0.16516	0.58787	0.24697
158	IRPYD	0.39638	0.04992	0.00492	0.00304	0.99204
159	IRSBD	1808318.466	0.3187	0.18708	0.10583	0.70709
160	IRSBDC	747913658.5	0.21873	0.40774	0.53263	0.05963

No.	Actual	Cov (act,sim)	Theil U-Stat.	Theil U-Bias	Theil U-Var	Theil U-Cov
161	IRSDV	4709862029	0.05513	0.11815	0.81285	0.06899
162	IRSDVPGDPM	900734967.1	0.09458	0.02973	0.18939	0.78088
163	IRSP	336835671.6	0.1057	0.01916	0.00091	0.97994
164	IRSPV	1850172875	0.14002	0.09242	0.62226	0.28532
165	IRSUB	2231129.695	0.35576	0.51769	0.3475	0.13481
166	IRSUBV	10965082.26	0.3126	0.22428	0.67362	0.1021
167	IRTBD	19054106.21	0.21925	0.05806	0.00882	0.93312
168	IRTBDC	1270063220	0.10311	0.39403	0.42401	0.18196
169	IRTOT	-998743616	0.94404	0.038	0.81625	0.14574
170	IRUNEMP	-2628158.39	0.96324	0.35718	0.33234	0.31047
171	IRUNEMPR	-147.00791	0.96355	0.20179	0.73197	0.06624
172	IRVAOIL	328082732	0.04797	0.42796	0.00037	0.57167
173	IRVAOILV	2263880719	0.10646	0.11516	0.34401	0.54083
174	IRWIND	5467.76034	0.28818	0.17396	0.77529	0.05075
175	IRWINDPGDPM	1759.58259	0.20648	0.38478	0.34026	0.27496
176	IRWPI	2625.53689	0.15115	0.21095	0.47043	0.31862
177	IRWPID	3062.81945	0.10202	0.15543	0.36042	0.48415
178	IRWPIM	1484.6395	0.30621	0.25293	0.491	0.25607
179	IRWPIX	2370.45173	0.43674	0.24068	0.69639	0.06293
180	IRX	493111605.6	0.10487	0.19964	0.0787	0.72166
181	IRXFY	25092322.77	0.07918	0.00755	0.10941	0.88303
182	IRXFYSD	746259.0163	0.0868	0.00014	0.13079	0.86907
183	IRXFYV	20948251.83	0.15828	0.04118	0.80749	0.15132
184	IRXGD	110158306.6	0.10943	0.39502	0.34246	0.26252
185	IRXGNOD	4393431.271	0.22487	0.23465	0.55227	0.21308
186	IRXGNODOP	332.69244	0.24298	0.08446	0.5923	0.32324
187	IRXNFS	5798014.616	0.1684	0.10236	0.4458	0.45185
188	IRXNFSD	796786.6984	0.23643	0.05842	0.55968	0.3819
189	IRXNFSDOP	69.26034	0.26916	0.10236	0.36514	0.5325
190	IRXNFSV	60083479.55	0.2429	0.07828	0.89867	0.02305
191	IRXNOILG	63363358.88	0.26914	0.08446	0.59701	0.31852
192	IRXNOILGV	252326880.5	0.20973	0.17635	0.79608	0.02758
193	IRXOIL	329541137.6	0.0619	0.42491	0.00034	0.57475
194	IRXOILB	198717.9283	0.06604	0.42491	0.0002	0.57489
195	IRXOILD	82341857.54	0.08967	0.43946	0.26345	0.29709
196	IRXOILV	2329546302	0.07318	0.11392	0.84395	0.04213
197	IRXSD	2231848.123	0.12927	0.04696	0.08489	0.86816
198	IRXV	5086731300	0.12012	0.13584	0.85289	0.01128
199	IRYD	4709861669	0.04337	0.2364	0.35473	0.40887
200	IRYDV	26298946125	0.07793	0.06361	0.52473	0.41166

4-3 Evaluation of Model's Forecast Power

The next tables are summaries of the above statistics for different simulations within the sample period. Let's suppose we want to predict for next N years within the sample. We separate N-years periods from the ending year of sample period, and then make dynamic simulation. We do select another N-years period and repeat the operations until covering whole sample. When, N=1 the two dynamic and static simulators are coincided. In dynamic simulation the previous years' simulated values are used as initiation for current years' simulation, but in static simulation the previous years' actual values are used as initial values.

In this section, we try to evaluate the prediction power of the model for the next 1, 2, 3, 5, 10 and 42 years which are the different N numbers. The following tables are summaries of calculated statistics for each of the above situations. We concluded that the model has the prediction power for different years ahead and we have more accuracy for the shorter forecast periods. The prediction accuracy is different for different variables.

Statistical evaluation for dynamic simulations for periods of 1 year in 1959-2003								
Eq. No.	Variable	RMS % error	MA % error	Corr (act,sim)	Theil U-Stat.	Theil U-Bias	Theil U-Var	Theil U-Cov
195	IRXOILD	5.2%	3.5%	99.7%	2.3%	1.0%	0.8%	98.3%
93	IRMGDCIFP	18.7%	14.0%	95.2%	7.6%	0.5%	0.8%	98.7%
186	IRXGNODOP	39.2%	26.6%	96.0%	9.0%	0.6%	0.6%	98.9%
87	IRM2V	13.0%	9.4%	99.9%	1.5%	3.5%	8.2%	88.3%
38	IRGDPM	3.6%	3.0%	99.6%	1.7%	0.4%	0.2%	99.4%
40	IRGDPNF	5.2%	4.1%	99.7%	1.8%	1.2%	0.2%	98.6%
68	IRIP	16.8%	13.3%	95.3%	7.1%	0.2%	6.9%	93.0%
11	IRC	5.8%	4.1%	99.5%	2.3%	1.2%	0.2%	98.6%
25	IREM	44.8%	23.3%	99.6%	4.1%	4.1%	5.7%	90.3%
16	IRCPI	10.1%	7.8%	99.9%	2.2%	5.4%	1.6%	93.1%
170	IRUNEMP	17.0%	11.2%	98.1%	5.0%	0.2%	0.0%	99.8%
26	IREMP	1.0%	0.8%	99.9%	0.6%	0.2%	0.4%	99.4%
70	IRIRNB	11.4%	8.4%	91.6%	6.8%	1.0%	2.2%	96.7%

Statistical evaluation for dynamic simulations for periods of 2 years in 1959-2003								
Eq. No.	Variable	RMS % error	MA % error	Corr (act,sim)	Theil U-Stat.	Theil U-Bias	Theil U-Var	Theil U-Cov
195	IRXOILD	5.8%	4.1%	99.5%	2.7%	2.5%	1.6%	95.8%
93	IRMGDCIFP	20.0%	15.0%	94.6%	8.1%	1.3%	0.5%	98.2%
186	IRXGNODOP	54.0%	36.5%	94.0%	11.1%	1.5%	0.1%	98.4%
87	IRM2V	19.1%	12.9%	99.9%	2.0%	3.7%	10.2%	86.1%
38	IRGDPM	4.2%	3.5%	99.4%	2.1%	1.1%	0.1%	98.9%
40	IRGDPNF	5.9%	4.7%	99.6%	2.1%	3.0%	0.1%	96.8%
68	IRIP	19.3%	14.7%	94.1%	7.8%	0.7%	5.8%	93.6%
11	IRC	6.7%	5.1%	99.3%	2.8%	3.7%	0.2%	96.1%
25	IREM	63.6%	31.3%	99.6%	4.4%	5.3%	14.0%	80.7%
16	IRCPI	15.8%	11.7%	99.8%	2.8%	9.2%	12.0%	78.8%
170	IRUNEMP	22.4%	15.3%	95.9%	7.4%	0.0%	0.0%	100%
26	IREMP	1.5%	1.1%	99.8%	0.9%	0.1%	0.4%	99.5%
70	IRIRNB	11.8%	9.0%	90.7%	7.1%	1.0%	2.3%	96.8%

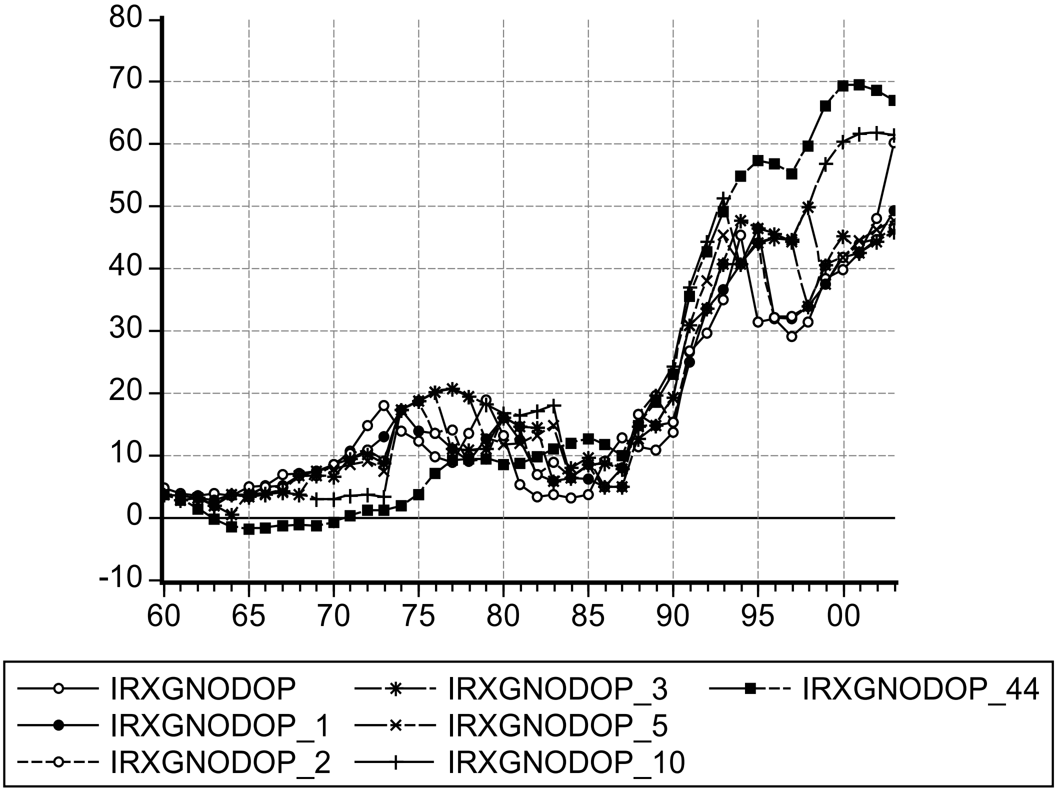
Statistical evaluation for dynamic simulations for periods of 3 years in 1959-2003								
Eq. No.	Variable	RMS % error	MA % error	Corr (act,sim)	Theil U-Stat.	Theil U-Bias	Theil U-Var	Theil U-Cov
195	IRXOILD	7.1%	5.1%	99.3%	3.4%	5.1%	3.4%	91.5%
93	IRMGDCIFP	21.8%	15.3%	93.6%	8.5%	4.0%	0.0%	96.0%
186	IRXGNODOP	76.1%	47.2%	91.8%	13.4%	6.7%	2.8%	90.6%
87	IRM2V	24.1%	15.8%	99.9%	2.2%	6.2%	42.4%	51.4%
38	IRGDPM	4.6%	3.7%	99.2%	2.3%	3.3%	0.7%	96.0%
40	IRGDPNF	6.1%	4.9%	99.5%	2.3%	8.0%	0.1%	91.9%
68	IRIP	20.9%	15.2%	93.0%	8.1%	2.3%	3.6%	94.1%
11	IRC	7.2%	5.8%	99.1%	3.1%	5.3%	1.0%	93.7%
25	IREM	84.0%	41.7%	99.5%	6.0%	13.2%	34.5%	52.3%
16	IRCPI	20.3%	14.0%	99.8%	3.0%	9.9%	2.5%	87.6%
170	IRUNEMP	28.4%	18.8%	92.9%	9.3%	0.4%	0.1%	99.5%
26	IREMP	1.8%	1.4%	99.7%	1.0%	0.5%	0.4%	99.1%
70	IRIRNB	11.2%	8.9%	92.9%	6.1%	0.0%	0.0%	100%

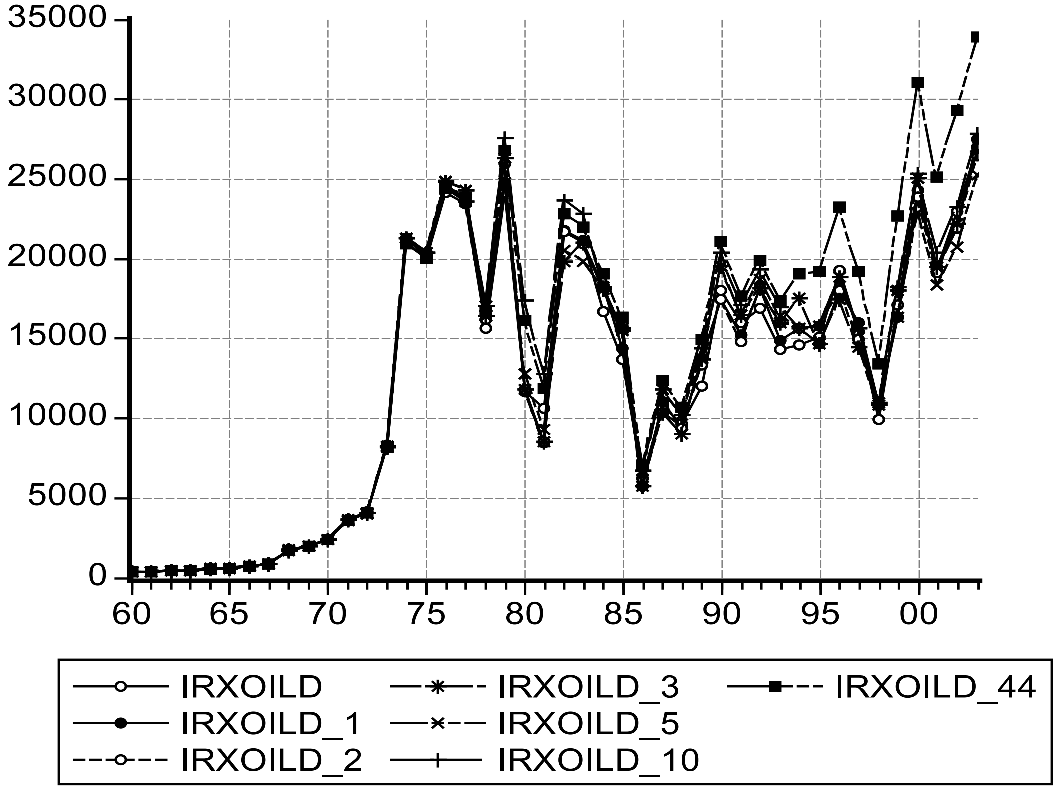
Statistical evaluation for dynamic simulations for periods of 5 years in 1959-2003								
Eq. No.	Variable	RMS % error	MA % error	Corr (act,sim)	Theil U-Stat.	Theil U-Bias	Theil U-Var	Theil U-Cov
195	IRXOILD	6.9%	5.6%	99.1%	3.4%	5.1%	0.6%	94.2%
93	IRMGDCIFP	19.1%	13.7%	93.6%	8.0%	7.3%	0.0%	92.7%
186	IRXGNODOP	83.7%	52.3%	89.9%	14.9%	14.1%	2.2%	83.7%
87	IRM2V	30.7%	18.7%	100.0%	1.8%	12.4%	45.8%	41.9%
38	IRGDPM	3.7%	3.0%	99.5%	1.8%	18.5%	1.0%	80.5%
40	IRGDPNF	5.8%	4.4%	99.7%	1.9%	28.2%	1.3%	70.5%
68	IRIP	19.6%	14.6%	93.0%	7.7%	4.7%	5.4%	89.9%
11	IRC	7.2%	5.8%	99.2%	3.1%	19.1%	5.4%	75.5%
25	IREM	136.5%	63.8%	99.5%	4.6%	13.5%	5.5%	81.0%
16	IRCPI	20.0%	14.6%	99.7%	3.7%	5.3%	0.1%	94.5%
170	IRUNEMP	32.4%	22.7%	92.9%	9.3%	0.6%	15.8%	83.6%
26	IREMP	2.0%	1.6%	99.7%	1.2%	0.1%	12.2%	87.7%
70	IRIRNB	11.3%	9.1%	92.4%	6.2%	0.0%	0.0%	100%

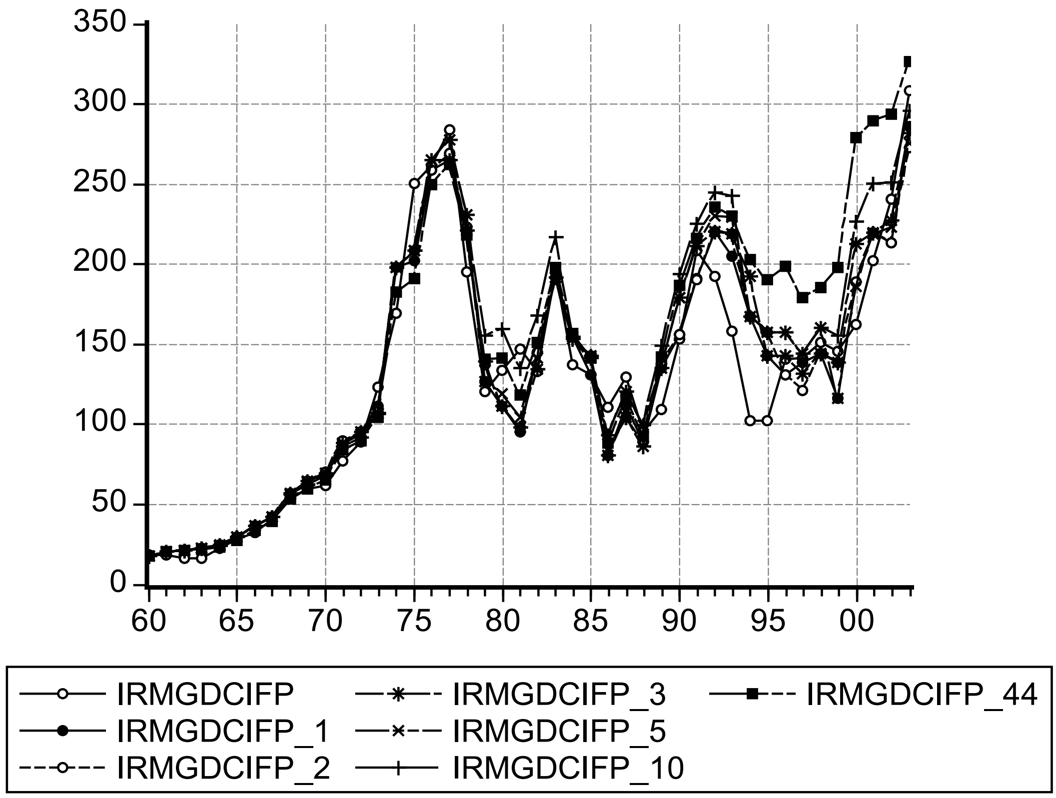
Statistical evaluation for dynamic simulations for periods of 10 years in 1959-2003								
Eq. No.	Variable	RMS % error	MA % error	Corr (act,sim)	Theil U-Stat.	Theil U-Bias	Theil U-Var	Theil U-Cov
195	IRXOILD	11.5%	7.4%	99.1%	4.9%	43.6%	8.9%	47.6%
93	IRMGDCIFP	21.9%	16.0%	93.7%	9.2%	28.9%	2.2%	69.0%
186	IRXGNODOP	110.6%	71.8%	91.1%	19.1%	28.0%	24.9%	47.0%
87	IRM2V	42.6%	27.1%	99.9%	2.0%	1.5%	41.9%	56.6%
38	IRGDPM	5.0%	4.1%	99.5%	2.5%	37.7%	17.8%	44.5%
40	IRGDPNF	6.8%	5.6%	99.6%	2.8%	43.6%	15.4%	40.9%
68	IRIP	22.0%	17.0%	93.2%	8.4%	24.4%	0.1%	75.5%
11	IRC	9.0%	8.2%	99.3%	4.3%	42.1%	23.4%	34.5%
25	IREM	140.5%	72.5%	99.3%	5.8%	2.0%	27.8%	70.1%
16	IRCPI	27.7%	19.9%	99.6%	4.7%	18.3%	23.6%	58.1%
170	IRUNEMP	38.7%	29.9%	80.7%	15.7%	8.7%	10.6%	80.6%
26	IREMP	2.5%	2.0%	99.5%	1.4%	0.1%	5.1%	94.7%
70	IRIRNB	11.8%	9.6%	91.9%	6.4%	0.2%	0.5%	99.3%

Statistical evaluation for dynamic simulation for period of 44 years in 1959-2003								
Eq. No.	Variable	RMS % error	MA % error	Corr (act,sim)	Theil U-Stat.	Theil U-Bias	Theil U-Var	Theil U-Cov
195	IRXOILD	17.0%	12.4%	98.5%	9.0%	44.9%	25.4%	29.7%
93	IRMGDCIFP	29.3%	19.8%	91.2%	12.4%	21.0%	7.7%	71.3%
186	IRXGNODOP	100.6%	82.1%	92.0%	24.3%	8.6%	59.2%	32.1%
87	IRM2V	57.5%	34.8%	99.8%	5.3%	7.5%	70.2%	22.3%
38	IRGDPM	6.2%	5.2%	99.3%	3.7%	10.2%	45.2%	44.7%
40	IRGDPNF	6.5%	5.6%	99.6%	3.4%	11.2%	43.6%	45.2%
68	IRIP	24.5%	18.5%	92.1%	10.9%	16.4%	10.1%	73.5%
11	IRC	9.4%	7.8%	98.9%	5.3%	18.6%	37.1%	44.3%
25	IREM	140.8%	62.0%	98.4%	11.8%	6.4%	53.4%	40.2%
16	IRCPI	38.1%	26.0%	99.4%	5.0%	6.9%	7.6%	85.5%
170	IRUNEMP	285.7%	206.2%	-81.7%	96.3%	36.5%	33.1%	30.3%
26	IREMP	3.1%	2.4%	99.3%	1.9%	5.7%	11.5%	82.8%
70	IRIRNB	13.3%	10.3%	90.4%	7.8%	2.6%	4.4%	93.0%

The following graphs show the summary of the above tables.



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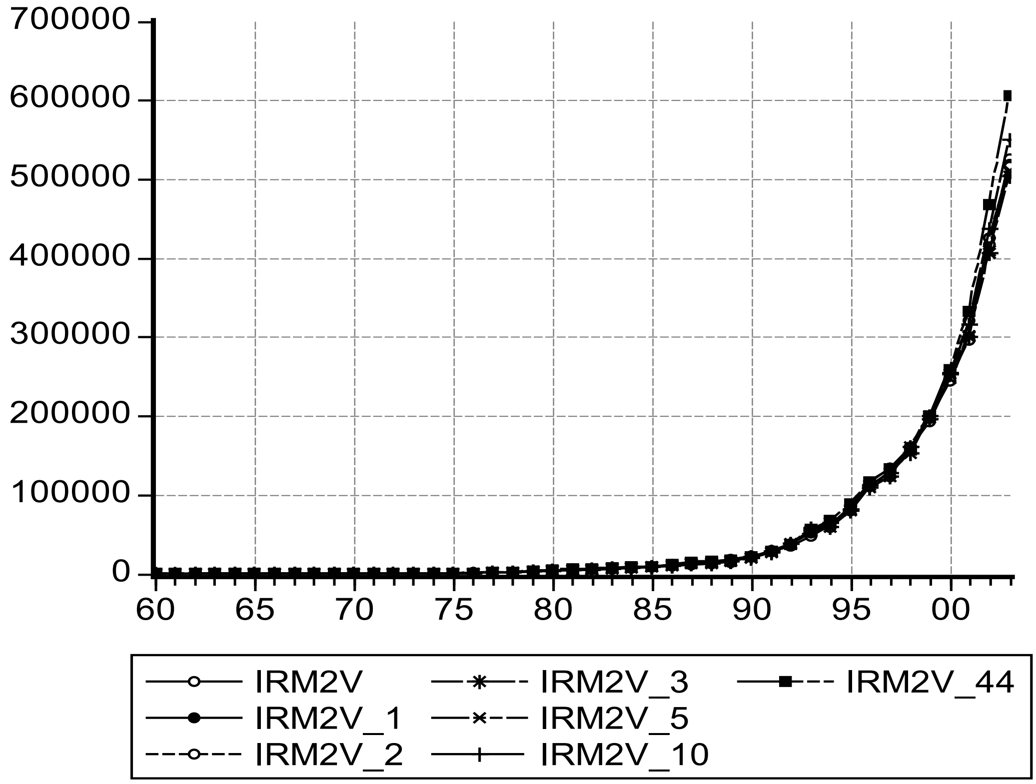
IRMGDCIFP_2
IRMGDCIFP_10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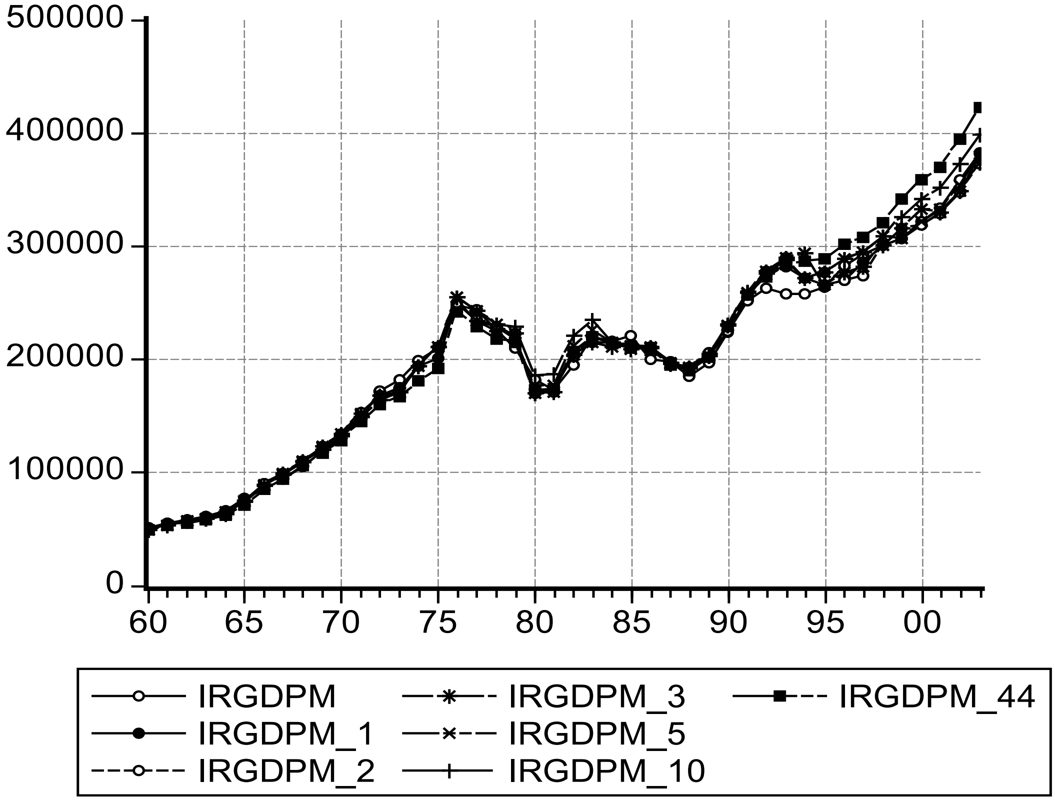
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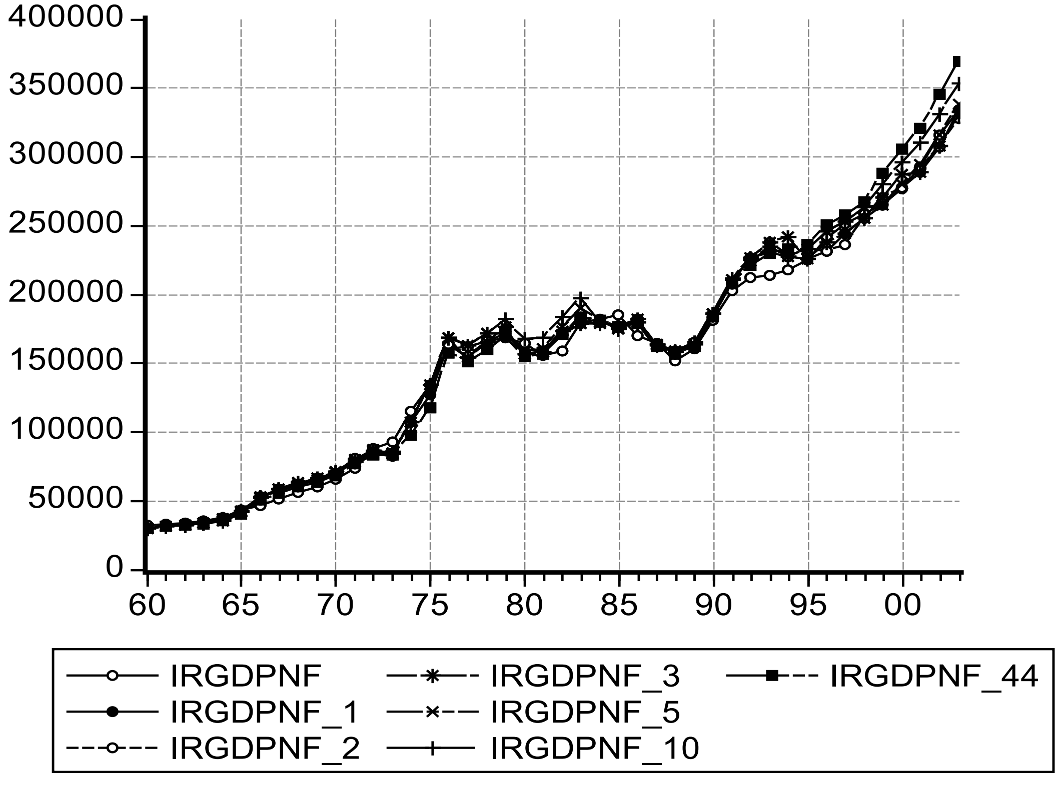
IRGDPM_44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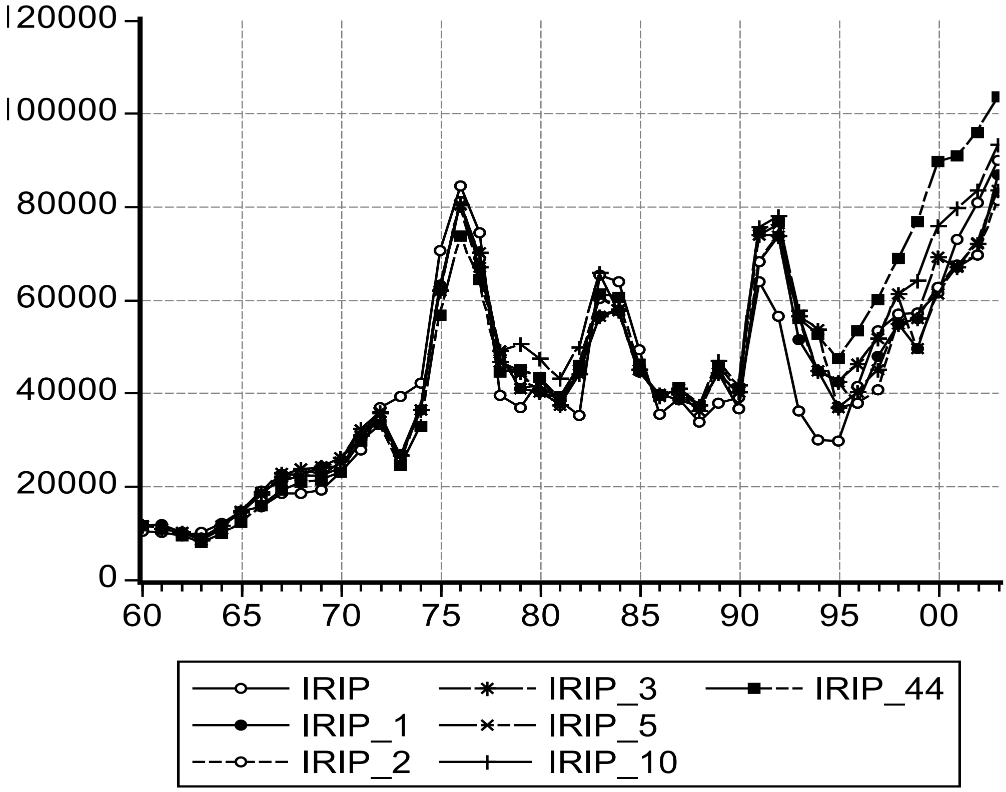
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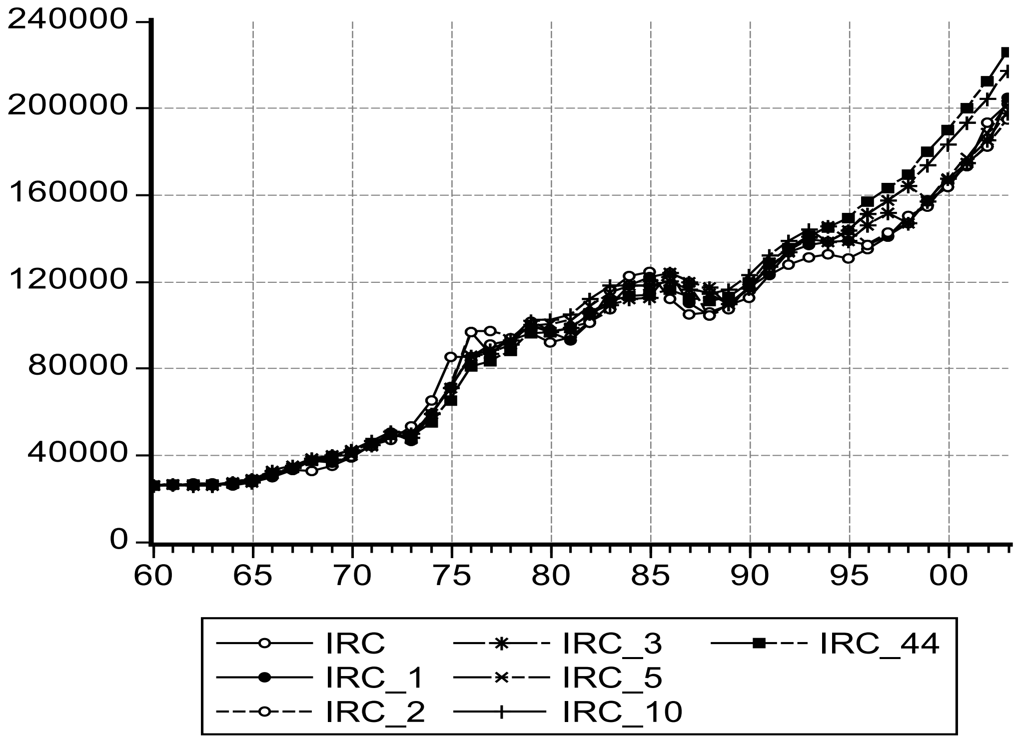
IRIP_44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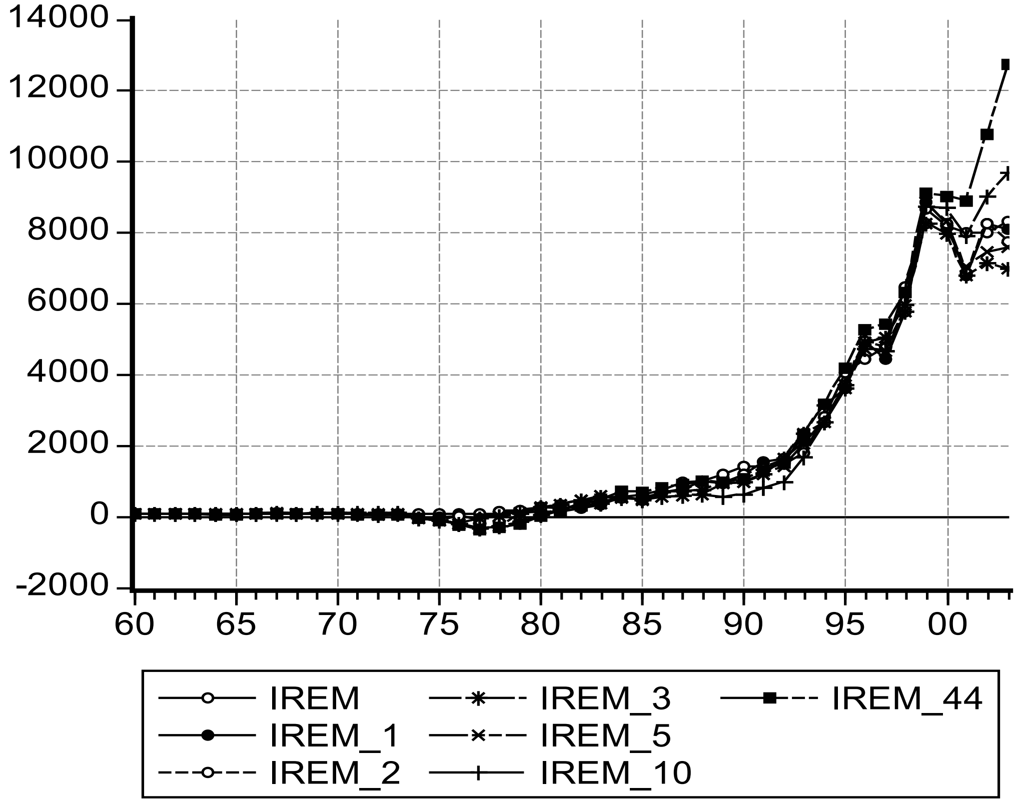
IRC_44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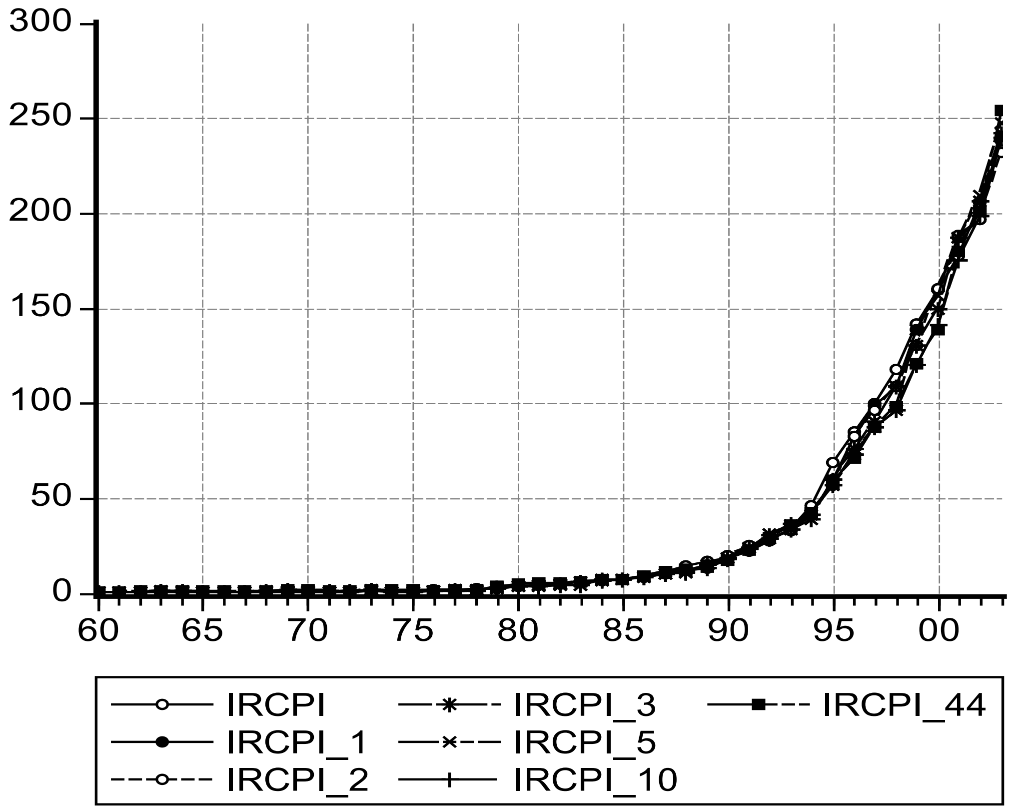
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IRCPI_10
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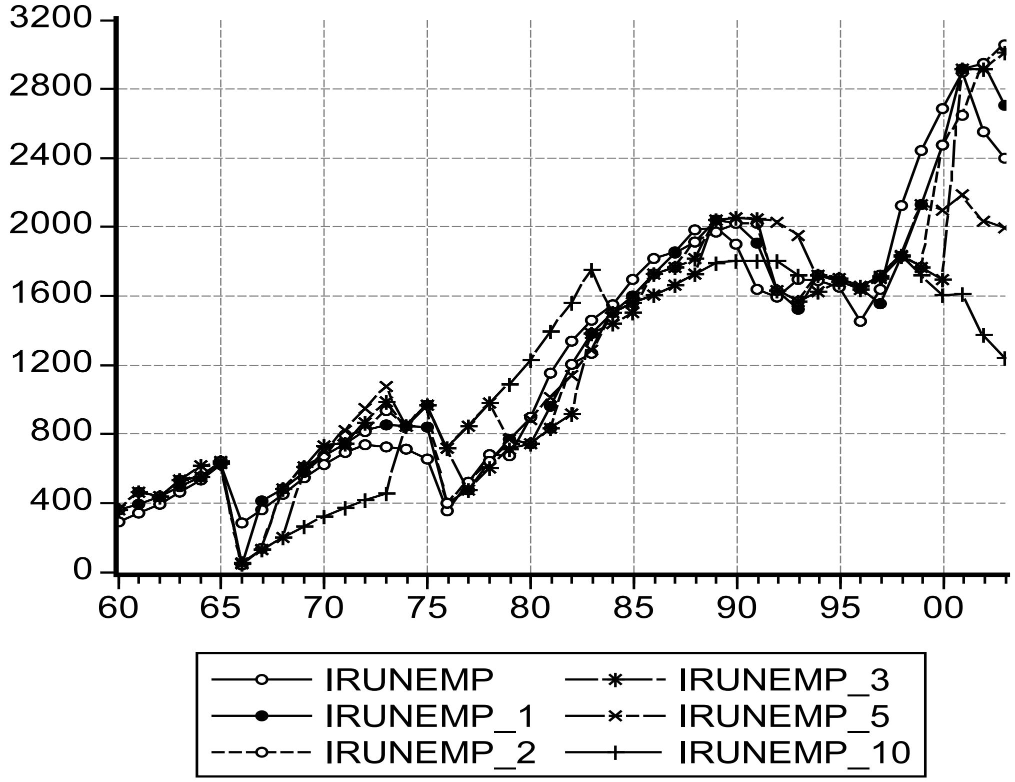
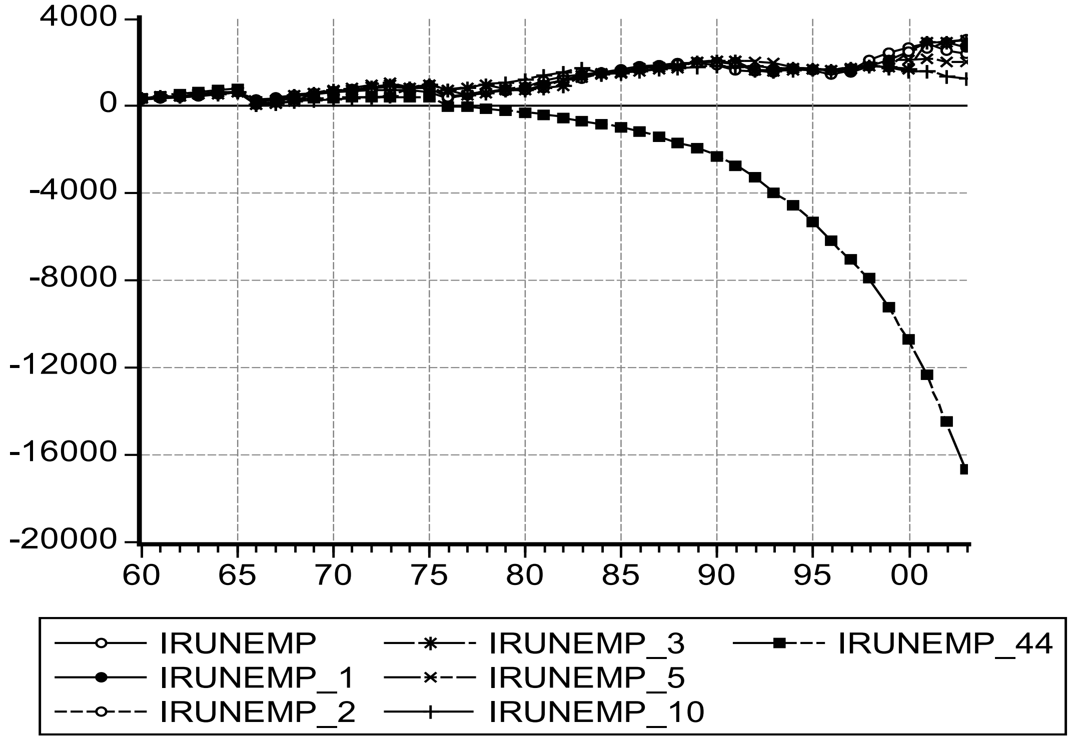
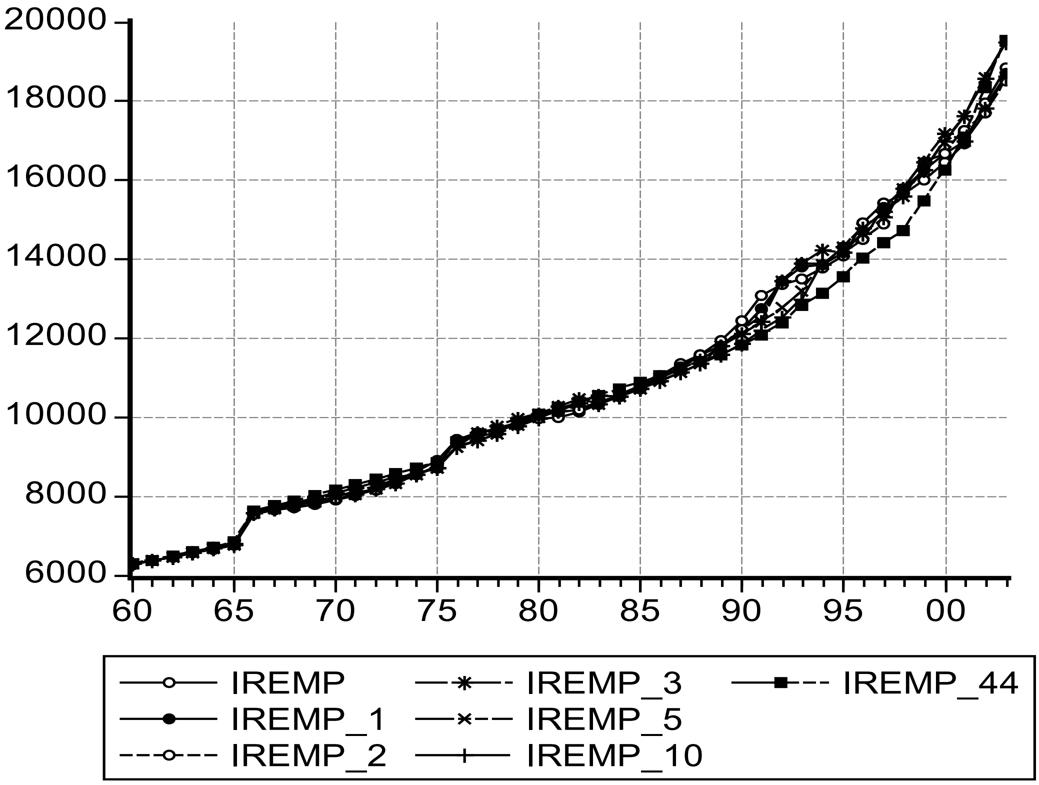


There was an unsolved divergent solution for IRUNEMP at 44 years dynamic solution. The following graph shows this problem.

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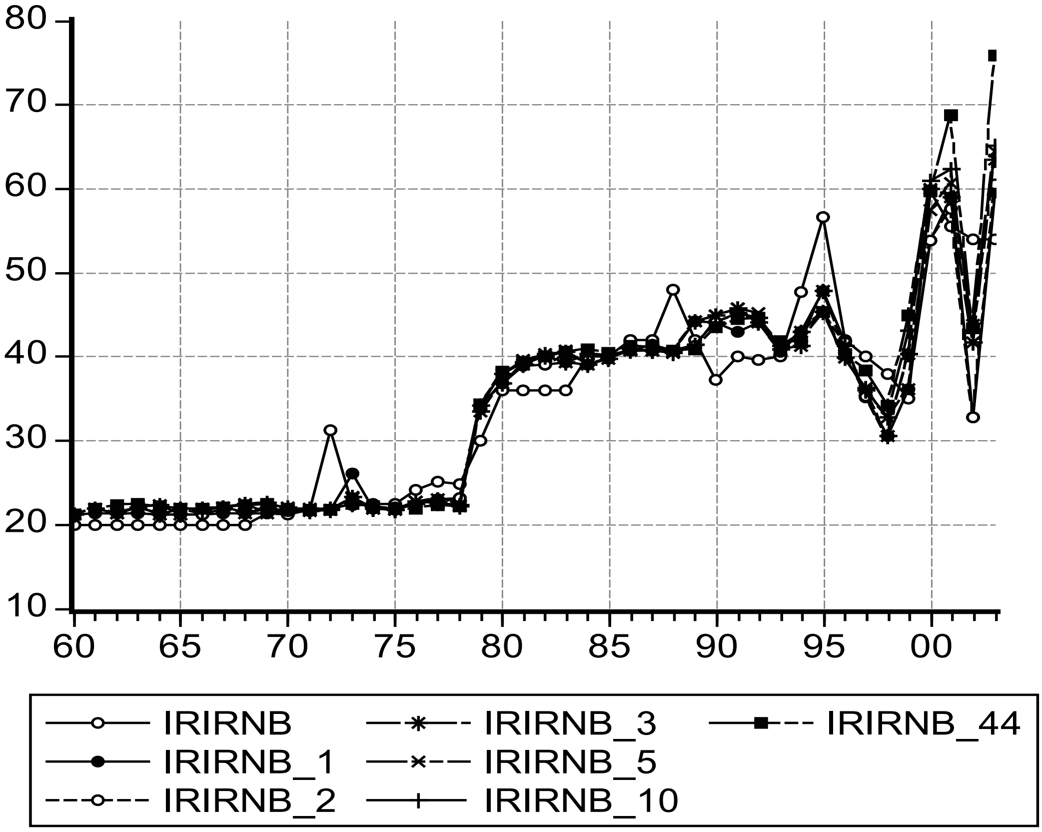
IREMP_44
IREMP_1
IREMP_5
IREMP_2
IREMP_10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IRIRNB_1
IRIRNB_5
IRIRNB_2
IRIRNB_10

Chapter Five

Policy Shock Analysis of the Model

5-1 Shock Analysis

To evaluate the effects of different policies on all endogenous variables, we first solve the model with previous exogenous variables and find the simulated value for endogenous variables. This solution is named “Control Solution”. Then, we change exogenous variable one by one in each scenario with a determined amount and again, solve the model to find new simulated values for endogenous variables. The differences between variables of this simulation and control solution will show the shock effect on exogenous policy variable.

In analyzing every shock, a summery table is depicted. In shock analyzing we should precisely consider the interdependent effects of different sectors, variables and equations. By changing an exogenous variable within the sample, we should consider the relationship between the shocked variable and other exogenous variables. This means that exogenous variables have also some behavioral relation which we did not specify in the model. For example, both oil export revenue and government budget are exogenous and with increasing the first one, the second one will also increase, while for analyzing independent shocks we will not consider this interrelationship. So, it would be better to define one group of exogenous variables and then examine their effects on endogenous variables. Independent shocks are chosen without considering the interrelations between exogenous variables, and one exogenous variable is changed independently.

The next important point for examining shock's effects is the non-proportional relationship between the shock in exogenous variable and the corresponding endogenous simulated variables. In other words, if we increase the amount of one exogenous variable by 10% and the corresponding endogenous variable increases by 2%, we cannot conclude that 20% increase in the first one, will cause 4% increase in the second one. Because, by solving the whole model simultaneously in different time periods, the amount and also direction of effects can differ in different periods. This would be the case even the model is linear in variables and parameters both. This phenomenon is mainly based on the time changes and fluctuations during time.

5-2 The Simulated Shocks

1. This shock is defined on the basis of 1% increase in import of machinery and equipment over total goods import ratio.
2. This shock is defined on the basis of 1% increase in banking deposit interest rate
3. In this shock, we increase banking facilities interest rates by 1%.
4. This shock is defined by increasing 10% on domestic oil products prices.
5. The government development expenditure shock is defined by 10% increase in this variable.

6. The current government expenditure shock is defined by 10% increase in current government expenditure.
7. Amount of foreign exchange sold in non-official foreign currency market: In this shock we try to evaluate the effect of sales of foreign currency equivalent to 1000 billion Rials in non-official foreign currency market.
8. The obligatory banking credit facility for private sector is defined by increasing this variable by 1000 Rials.
9. The obliged banking credit facility for government sector is defined by increasing this variable by 1000 Rials.
10. The amount of foreign exchange reserve obligation account for 1000 billion Rials increase.
11. The London interbank (LIBOR) interest rate by 1% increase.
12. The consumer price index in industrial countries with 10% increase.
13. One billion dollars increase in the capital account of balance of payments.
14. Export exchange rate shock is defined by 10% devaluation of national currency in relation to dollar for foreign exchange rate for export of goods and services.
15. The official exchange rate. This shock is defined by 10% devaluation of national currency against dollar for official exchange rate.
16. The oil production shock with 10% increase in oil production.
17. The international oil price shock is defined by one dollar increase in this variable.
18. The import (cif) price index shock is defined by 10% increase in this variable.

5-2-1 Shock: Import Share of Machinery and Equipment

PCH_IRMACHIMV TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: %1 increase in import share of machinery and equipment

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	0.07	-0.08	-0.24	-0.37	-0.16
3	IRXGNODOP	0.02	0.02	0.01	0.00	0.01
4	IRM2V	0.12	0.37	0.44	0.58	0.38
5	IRGDPM	0.19	0.26	0.27	0.30	0.26
6	IRGDPNF	0.22	0.28	0.29	0.32	0.28
7	IRIP	1.67	1.75	1.56	1.50	1.62
8	IRC	0.12	0.17	0.20	0.23	0.18
9	IREM	0.20	0.88	1.34	2.19	1.15
10	IRCPI	0.10	0.29	0.32	0.41	0.28
11	IREMP	0.04	0.07	0.08	0.11	0.07
12	IRIRNB	1.13	0.84	0.19	0.40	0.64

5-2-2 Shock: Saving Deposits Interest Rate

PCH_IRIRS TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: %1 increase in saving deposits interest rate

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	1.67	3.29	4.81	4.49	3.57
3	IRXGNODOP	0.08	0.32	0.52	0.60	0.38
4	IRM2V	-2.45	-4.35	-4.66	-4.30	-3.94
5	IRGDPM	0.17	0.39	0.68	0.89	0.53
6	IRGDPNF	0.19	0.44	0.75	0.97	0.59
7	IRIP	1.30	2.90	4.25	4.42	3.22
8	IRC	0.11	0.25	0.46	0.64	0.36
9	IREM	-3.86	-9.83	-13.27	-14.88	-10.46
10	IRCPI	0.32	-0.06	0.92	1.98	0.79
11	IREMP	0.05	0.06	0.22	0.39	0.18
12	IRIRNB	1.55	0.48	7.14	5.71	3.72

5-2-3 Shock: Banking Loans Interest Rate

PCH_IRIRL TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: %1 increase in banking loans interest rate

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	0.05	1.22	1.84	2.06	1.29
3	IRXGNODOP	-0.10	0.03	0.07	0.11	0.03
4	IRM2V	-0.96	-2.59	-2.48	-2.63	-2.16
5	IRGDPM	-0.72	-0.85	-0.78	-0.69	-0.76
6	IRGDPNF	-0.82	-0.93	-0.85	-0.75	-0.84
7	IRIP	-3.87	-3.40	-2.77	-1.92	-2.99
8	IRC	-0.45	-0.59	-0.62	-0.61	-0.57
9	IREM	-1.57	-6.05	-7.34	-9.63	-6.14
10	IRCPI	-0.11	-1.39	-0.73	-0.58	-0.70
11	IREMP	-0.12	-0.28	-0.22	-0.21	-0.21
12	IRIRNB	-2.82	-3.68	2.64	1.51	-0.59

5-2-4 Shock: Domestic Prices of Oil Products

PCH_IRPDOIL TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: %10 increase in domestic prices of oil products

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	-0.35	-0.30	-0.31	-0.21	-0.29
3	IRXGNODOP	0.03	0.06	0.09	0.12	0.08
4	IRM2V	0.56	0.40	0.35	0.25	0.39
5	IRGDPM	0.00	-0.01	-0.02	-0.01	-0.01
6	IRGDPNF	0.00	-0.01	-0.01	-0.01	-0.01
7	IRIP	-0.26	-0.24	-0.26	-0.19	-0.24
8	IRC	0.01	0.00	0.00	0.00	0.00
9	IREM	0.89	0.89	0.96	0.83	0.89
10	IRCPI	-0.40	-0.51	-0.55	-0.64	-0.52
11	IREMP	0.05	0.04	0.04	0.03	0.04
12	IRIRNB	-1.20	-0.51	-0.39	-0.37	-0.62

5-2-5 Shock: Government Development Expenditures

PCH_IRGEDV TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: %10 increase in government development expenditures

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	0.09	-0.06	-0.20	-0.32	-0.12
3	IRXGNODOP	0.04	0.05	0.07	0.10	0.07
4	IRM2V	0.20	0.40	0.53	0.71	0.46
5	IRGDPM	0.29	0.33	0.42	0.57	0.40
6	IRGDPNF	0.32	0.37	0.47	0.63	0.45
7	IRIP	0.16	0.33	0.28	0.26	0.26
8	IRC	0.18	0.23	0.31	0.43	0.29
9	IREM	0.34	0.96	1.62	2.70	1.41
10	IRCPI	0.12	0.20	0.30	0.35	0.24
11	IREMP	0.05	0.08	0.11	0.16	0.10
12	IRIRNB	0.78	0.57	0.76	0.77	0.72

5-2-6 Shock: Government Current Expenditures

PCH_IRGECV TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: %10 increase in government current expenditures

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	-0.20	-0.26	-0.35	-0.50	-0.33
3	IRXGNODOP	-0.06	-0.12	-0.17	-0.25	-0.15
4	IRM2V	0.21	0.27	0.27	0.41	0.29
5	IRGDPM	-0.09	-0.10	-0.12	-0.20	-0.13
6	IRGDPNF	-0.02	-0.03	-0.05	-0.09	-0.04
7	IRIP	-0.17	-0.25	-0.32	-0.48	-0.30
8	IRC	-0.01	-0.01	-0.03	-0.05	-0.02
9	IREM	0.32	0.59	0.76	1.43	0.78
10	IRCPI	0.37	0.48	0.56	0.86	0.57
11	IREMP	0.02	0.03	0.03	0.04	0.03
12	IRIRNB	0.65	0.39	0.24	0.83	0.53

5-2-7 Shock: Dollar Sale Revenue

PCH_IRGRDSV TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: 1000 billion Rials increase in dollar sale revenue

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	0.38	0.69	1.05	0.98	0.78
3	IRXGNODOP	0.02	0.06	0.12	0.15	0.09
4	IRM2V	0.06	0.12	0.10	0.27	0.14
5	IRGDPM	0.04	0.09	0.14	0.19	0.11
6	IRGDPNF	0.04	0.10	0.16	0.20	0.13
7	IRIP	0.30	0.61	0.93	0.96	0.70
8	IRC	0.02	0.06	0.10	0.14	0.08
9	IREM	-0.88	-2.04	-2.93	-3.26	-2.28
10	IRCPI	0.07	0.11	0.06	0.24	0.12
11	IREMP	0.01	0.03	0.03	0.07	0.03
12	IRIRNB	0.35	0.38	0.61	0.91	0.56

5-2-8 Shock: Government Budget Private Obligation Loans

PCH_IROLPV TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: 1000 billion Rials increase in government budget private obligation loans

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	0.01	0.05	0.10	0.14	0.07
3	IRXGNODOP	0.01	0.02	0.04	0.06	0.03
4	IRM2V	-0.01	-0.07	-0.10	-0.14	-0.08
5	IRGDPM	0.00	0.00	0.00	0.01	0.00
6	IRGDPNF	0.00	0.00	0.01	0.01	0.01
7	IRIP	0.01	0.03	0.07	0.11	0.06
8	IRC	0.00	0.00	0.00	0.01	0.00
9	IREM	-0.02	-0.16	-0.29	-0.49	-0.24
10	IRCPI	-0.04	-0.13	-0.18	-0.21	-0.14
11	IREMP	0.00	-0.01	-0.02	-0.02	-0.01
12	IRIRNB	-0.39	-0.47	-0.40	-0.16	-0.35

5-2-9 Shock: Government Budget Government Obligation Loans

PCH_IROLGV TABLE
Percentage change of shocked solution from control solution (%)
Policy shock:1000 billion Rials increase in government budget government obligation loans

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	0.01	0.02	0.04	0.07	0.04
3	IRXGNODOP	0.00	0.01	0.02	0.03	0.02
4	IRM2V	-0.01	-0.03	-0.05	-0.07	-0.04
5	IRGDPM	0.00	0.00	0.00	0.00	0.00
6	IRGDPNF	0.00	0.00	0.00	0.01	0.00
7	IRIP	0.00	0.02	0.03	0.06	0.03
8	IRC	0.00	0.00	0.00	0.00	0.00
9	IREM	-0.01	-0.08	-0.13	-0.26	-0.12
10	IRCPI	-0.03	-0.07	-0.08	-0.11	-0.07
11	IREMP	0.00	-0.01	-0.01	-0.01	-0.01
12	IRIRNB	-0.26	-0.27	-0.21	-0.11	-0.22

5-2-10 Shock: Foreign Exchange Obligation Account

PCH_IRFEOAV TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: 1000 billion Rials increase in foreign exchange obligation account

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	0.00	0.01	0.02	0.02	0.02
3	IRXGNODOP	0.00	0.01	0.01	0.01	0.01
4	IRM2V	-0.01	-0.02	-0.02	-0.02	-0.02
5	IRGDPM	0.00	0.00	0.00	0.00	0.00
6	IRGDPNF	0.00	0.00	0.00	0.00	0.00
7	IRIP	0.00	0.01	0.02	0.02	0.01
8	IRC	0.00	0.00	0.00	0.00	0.00
9	IREM	-0.01	-0.04	-0.06	-0.08	-0.05
10	IRCPI	-0.02	-0.03	-0.03	-0.03	-0.03
11	IREMP	0.00	0.00	0.00	0.00	0.00
12	IRIRNB	-0.17	-0.03	0.06	0.04	-0.03

5-2-11 Shock: London Interbank Offer Rate

PCH_LIBOR TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: %1 increase in London interbank offer rate

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	0.10	0.33	0.14	0.05	0.16
3	IRXGNODOP	0.03	0.11	0.10	0.08	0.08
4	IRM2V	-0.13	-0.41	-0.04	0.01	-0.14
5	IRGDPM	0.00	0.01	0.02	0.02	0.01
6	IRGDPNF	0.01	0.02	0.03	0.02	0.02
7	IRIP	0.07	0.26	0.13	0.07	0.13
8	IRC	0.03	0.04	0.05	0.05	0.04
9	IREM	-0.24	-1.04	-0.23	-0.11	-0.41
10	IRCPI	-0.16	-0.57	0.00	0.05	-0.17
11	IREMP	-0.01	-0.05	0.00	0.01	-0.01
12	IRIRNB	0.05	-0.95	1.96	0.32	0.35

5-2-12 Shock: CIF Import Prices

PCH_IRCIFP TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: %10 increase in CIF import prices

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	-4.25	-3.65	-3.51	-3.11	-3.63
3	IRXGNODOP	-0.29	-0.48	-0.65	-0.84	-0.57
4	IRM2V	-0.32	-0.49	-0.84	-0.74	-0.60
5	IRGDPM	-0.41	-0.52	-0.61	-0.67	-0.55
6	IRGDPNF	-0.47	-0.58	-0.67	-0.75	-0.61
7	IRIP	-3.31	-3.43	-3.39	-3.21	-3.34
8	IRC	-0.26	-0.35	-0.45	-0.53	-0.40
9	IREM	-0.18	-0.19	-0.99	-0.35	-0.43
10	IRCPI	-0.32	-0.20	-0.59	-0.09	-0.30
11	IREMP	-0.09	-0.11	-0.17	-0.15	-0.13
12	IRIRNB	-2.65	-0.53	-1.93	0.86	-1.06

5-2-13 Shock: Domestic Prices of Industrial Countries

PCH_OECDP TABLE

Percentage change of shocked solution from control solution (%)

Policy shock: %10 increase in domestic prices of industrial countries

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	2.81	2.84	3.36	3.01	3.01
3	IRXGNODOP	2.23	3.59	4.51	5.09	3.86
4	IRM2V	0.22	0.52	0.40	0.56	0.42
5	IRGDPM	0.24	0.36	0.44	0.50	0.39
6	IRGDPNF	0.26	0.39	0.48	0.55	0.42
7	IRIP	2.02	2.43	2.87	2.77	2.52
8	IRC	0.16	0.22	0.34	0.42	0.28
9	IREM	0.29	1.02	0.89	1.65	0.96
10	IRCPI	0.23	0.42	0.09	0.13	0.22
11	IREMP	0.06	0.10	0.09	0.12	0.09
12	IRIRNB	1.58	1.20	-0.39	0.22	0.65

5-2-14 Shock: Capital Account

PCH_IRKAD TABLE

Percentage change of shocked solution from control solution (%)

Policy shock: 1000 million dollars increase in capital account

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	3.52	2.96	2.79	2.11	2.85
3	IRXGNODOP	0.08	0.13	0.18	0.20	0.15
4	IRM2V	0.05	0.33	0.44	0.59	0.35
5	IRGDPM	0.29	0.38	0.42	0.42	0.38
6	IRGDPNF	0.32	0.41	0.45	0.46	0.41
7	IRIP	2.52	2.59	2.47	2.04	2.40
8	IRC	0.17	0.24	0.29	0.32	0.26
9	IREM	-0.06	0.43	0.81	1.51	0.67
10	IRCPI	-0.04	0.12	0.15	0.21	0.11
11	IREMP	0.04	0.08	0.09	0.11	0.08
12	IRIRNB	1.23	0.82	0.40	0.10	0.64

5-2-15 Shock: Export Exchange Rate

PCH_IREX TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: %10 devaluation of export exchange rate against dollar

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	0.40	0.58	0.75	0.63	0.59
3	IRXGNODOP	2.24	3.63	4.50	5.04	3.85
4	IRM2V	0.04	0.10	0.09	0.18	0.10
5	IRGDPM	0.03	0.07	0.09	0.11	0.08
6	IRGDPNF	0.04	0.07	0.10	0.12	0.08
7	IRIP	0.29	0.48	0.63	0.58	0.49
8	IRC	0.02	0.04	0.06	0.08	0.05
9	IREM	0.05	0.20	0.21	0.61	0.27
10	IRCPI	0.04	0.09	0.04	0.14	0.08
11	IREMP	0.01	0.02	0.02	0.04	0.02
12	IRIRNB	0.25	0.30	0.09	0.34	0.25

5-2-16 Shock: Official Exchange Rate

PCH_IREO TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: %10 devaluation of official exchange rate against dollar

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	0.00	0.00	0.00	0.00	0.00
2	IRMGDCIFP	-0.79	-0.66	-2.96	-2.04	-1.61
3	IRXGNODOP	-0.02	-0.04	-0.15	-0.09	-0.08
4	IRM2V	0.33	0.09	0.76	-0.11	0.27
5	IRGDPM	-0.05	-0.08	-0.29	-0.35	-0.20
6	IRGDPNF	-0.06	-0.09	-0.32	-0.37	-0.21
7	IRIP	-0.61	-0.60	-2.43	-1.99	-1.41
8	IRC	-0.03	-0.05	-0.18	-0.23	-0.12
9	IREM	0.48	0.07	1.89	-1.14	0.33
10	IRCPI	-0.31	-0.31	-1.02	-2.20	-0.96
11	IREMP	0.02	0.00	0.03	-0.11	-0.02
12	IRIRNB	-1.18	-0.22	-6.22	-4.72	-3.08

5-2-17 Shock: Foreign Price of Oil

PCH_IRWPOIL TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: 1 dollar increase in foreign price of oil

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	3.80	4.58	3.60	3.56	3.88
2	IRMGDCIFP	3.79	3.06	2.26	2.16	2.82
3	IRXGNODOP	0.10	0.16	0.20	0.26	0.18
4	IRM2V	0.20	0.45	0.82	0.80	0.57
5	IRGDPM	0.32	0.40	0.40	0.43	0.39
6	IRGDPNF	0.36	0.44	0.43	0.47	0.43
7	IRIP	2.72	2.69	2.08	2.05	2.38
8	IRC	0.20	0.27	0.30	0.35	0.28
9	IREM	0.26	0.88	2.20	2.58	1.48
10	IRCPI	-0.13	0.04	-0.10	-0.29	-0.12
11	IREMP	0.06	0.09	0.13	0.13	0.10
12	IRIRNB	1.18	0.79	-1.03	-0.67	0.07

5-2-18 Shock: Production of Oil

PCH_IRYOILB TABLE
Percentage change of shocked solution from control solution (%)
Policy shock: %10 increase in production of oil

No.	Variable Name	2000	2001	2002	2003	Period Mean
1	IRXOILD	14.26	14.40	14.93	14.13	14.43
2	IRMGDCIFP	15.76	10.59	10.05	8.65	11.26
3	IRXGNODOP	0.44	0.70	0.99	1.21	0.83
4	IRM2V	0.42	1.72	3.55	3.90	2.40
5	IRGDPM	3.14	3.21	3.16	3.37	3.22
6	IRGDPNF	1.64	1.78	1.95	2.12	1.87
7	IRIP	11.97	10.24	9.53	8.81	10.14
8	IRC	0.86	1.07	1.30	1.51	1.18
9	IREM	0.58	3.79	10.19	13.79	7.09
10	IRCPI	-0.23	0.02	-0.98	-1.15	-0.59
11	IREMP	0.38	0.45	0.63	0.73	0.55
12	IRIRNB	5.90	1.55	-4.91	-1.26	0.32

Chapter Six

Forecasting of the Model

6-1 Recent Trends[5]

In a major step to reform the economy, Iran’s 3rd development plan (2000-2004) is aimed for structural reforms in Iran's economy. Partial privatization of financial markets, balanced government budget, establishment of foreign exchange reserve fund/account (to stabilize the economy from oil price fluctuations), unification of exchange rate, and movement from fixed to managed float exchange rate system, revision of direct tax law to lower tax rates and indirect levies integration scheme, revising foreign investment protection and inducement law, abolition of export surrender requirement (deposit), removal of some non-tariff foreign trade barriers and changing the government budget book keeping to GFS[6] standards, strengthening the capital market (stock exchange), expansion of financial sector, and taking some steps in privatization of government's companies are the main reforms of the 3rd development plan. However, the economy is in a more stable position and in a better position for economic growth with the help of the higher oil revenues.

[5] Bijan Bidabad, Country Report: Iran (Based on Macro econometric Model of Iran Ver. 6.1), Project LINK Spring Meeting, Mexico City, May 2005.
[6] Government Financial Statistics developed by International Monetary Fund.

Accordingly, the average rate of GDP growth for the period of 2000-2003 was equal to 5.5%. The average inflation rate was 13.8% which is nearly half of the second development plan average. The following tables show the main macroeconomic variables after the revolution period.

Main economic variables during after the revolution period

%		**1st plan**		**2nd plan**	**3rd plan**		**4th plan**
Gregorian Calendar	1979-88	1989-93	1994	1995-99	2000-03	2004	2005-09
Hijri Shamsi Calendar	1358-67	1368-72	1373	1374-78	1379-82	1383	1384-88
Inflation	18.9	18.4	35.2	25.1	15.9	16.4	9.9
Economic growth	-1.9	7.4	0.5	3.2	5.5		8
Investment growth	-6.5	9.2	-14.2	8	11		12.2
Liquidity growth	23.1	23.6	35.8	44.6	28.6	28.7	20
Dollar/Rial % change	29	12.1	58.6	24.6	-0.8	-5	

Source: A quart of century ups and downs, review of Iran's economic changes, Ministry of Finance and Economic Affairs. 2004, Tehran, Iran.
Economic trends, Central Bank of Iran, No. 36,
http://www.cbi.ir/publications/PDF/etno38.pdf
Hijri Shamsi calendar starts at 21st March. 21 March 2004 Gregorian is 1st day of 1383 Hijri Shamsi.
4th plan items are approved figures from the law of 4th development plan.

The 4th development plan in merit is similar to the 3rd plan as well. The general approach of the 4th plan is more or less similar to the 3rd plan and it is not expected for great change in the economy from the plan sight of view. But two points are worth mentioning that are the upcoming presidential election and continuous oil price increase which may alter the whole approach to the development process of Iran.

Main economic variables during the after revolution period

Billion Dollars		**1st plan**		**2nd plan**	**3rd plan**		**4th plan**
Gregorian Calendar	1979-1988	1989-1993	1994	1995-1999	2000-2003	2004	2005-2009
Hijri Shamsi Calendar	1358-1367	1368-1372	1373	1374-1378	1379-1382	1383	1384-1388
Oil export	14.6	15.5	14.6	15.4	22.6	36	24
Nonoil export	0.6	2.3	4.8	3.1	4.5	7.5	10.5
Import	11.7	22.2	11.8	13.7	20.1	36	37

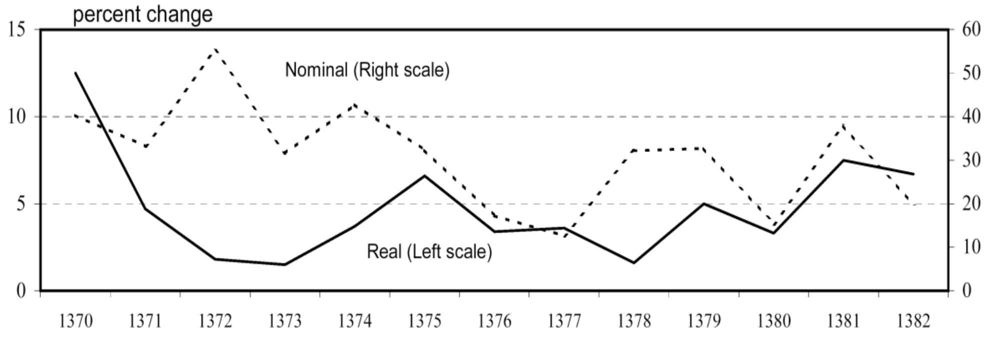
Source: A quart of century ups and downs, review of Iran's economic changes, Ministry of Finance and Economic Affairs. 2004, Tehran, Iran. And Central Bank of Iran. Economic trends, Central Bank of Iran, No. 36, http://www.cbi.ir/publications/PDF/etno38.pdf

Hijri Shamsi calendar starts at 21st March. 21 March 2004 Gregorian is 1st day of 1383 Hijri Shamsi.

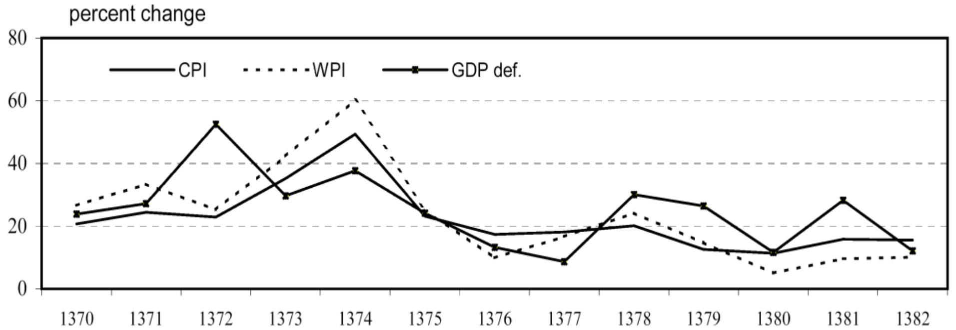
4th plan items are approved figures from the law of 4th development plan.

Major Economic Trends

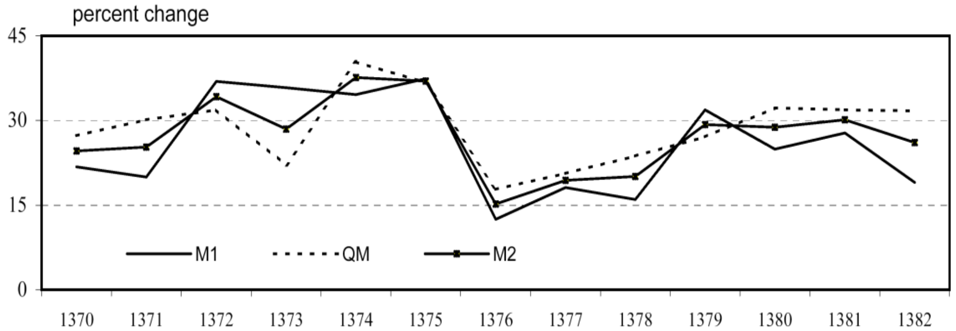
GDP Growth
percent change



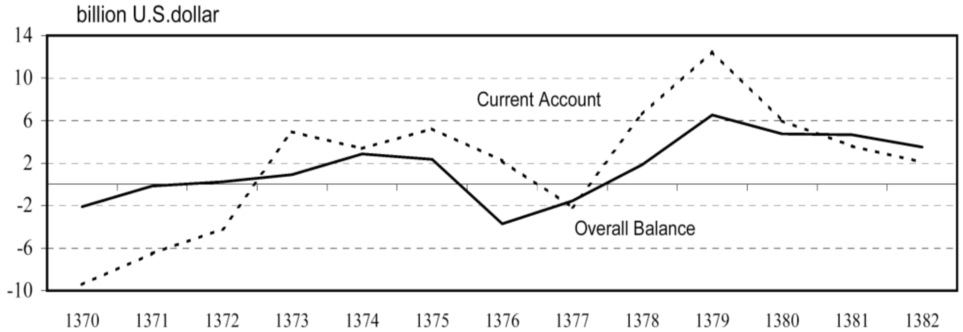
Inflation
percent change



Monetary Aggregates
percent change



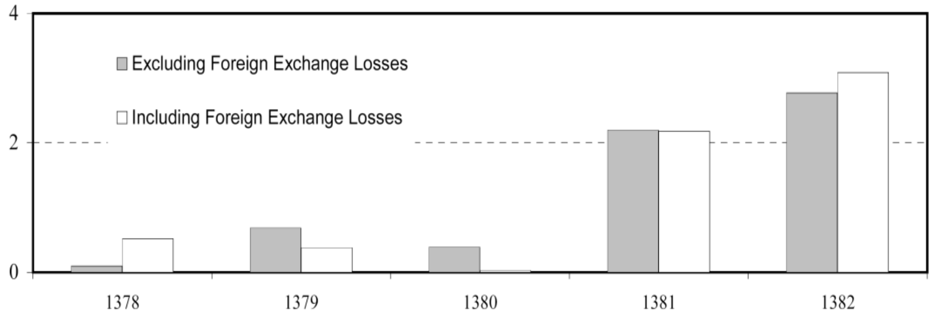
External Sector
billion U.S.dollar



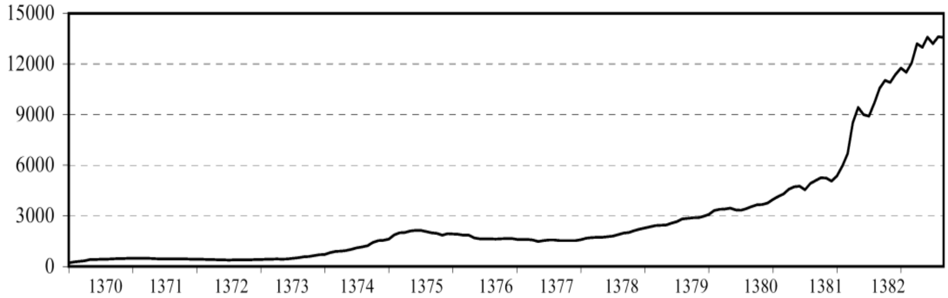
Source: Economic trends, Central Bank of Iran, No. 36,
http://www.cbi.ir/publications/PDF/etno38.pdf

Major Economic Trends

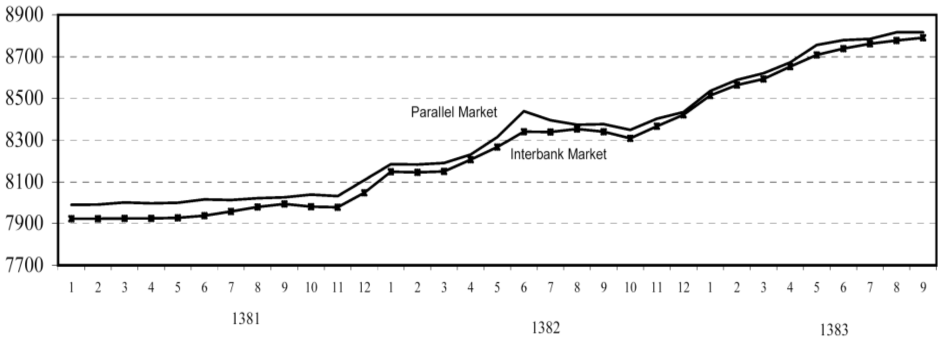
Government Budget Deficit
% of GDP



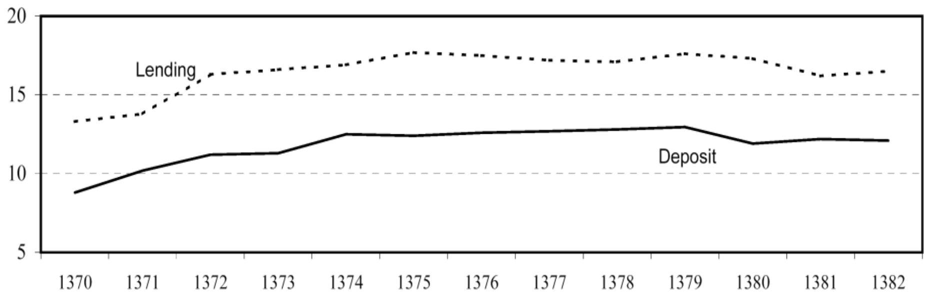
Share Price Index
1369=100



Exchange Rate
Iranian rial per U.S.dollar



Banks' Average Deposit & Lending Rates
Percent



Source: Economic trends, Central Bank of Iran, No. 36,
http://www.cbi.ir/publications/PDF/etno38.pdf

6-2 National Policy Assumptions

6-2-1 Foreign Exchange System

The currency of Iran is Iranian Rial. Prior to March 21, 2002, the exchange rate system consisted of two official rates, the “oil-notional rate” used for government budget and some external transactions. The “nonoil export” or “certificate of exchange deposit” rate was effectively equivalent to market exchange rate at Tehran Stock Exchange (TSE rate) and applied to nonoil export receipts and regular import transactions.

From the beginning of Iranian fiscal year March 21, 2002, a unified managed float foreign exchange system was adopted. Exchange rates unification was launched along with elimination of all exchange restrictions on current account transactions prior to March 2002. Therefore, all foreign exchange transactions that formerly took place in TSE were shifted to a newly established inter-bank market. The basic official rate (oil-notional rate) was eliminated, and the exchange rate was unified to the rate prevailing at TSE market before unification.

In the subsequent years, exchange rate is determined under a managed floating system. Thus, all foreign exchange regulations in the areas of transaction of goods, services, and banking operations were revised with the aim of complying with the new exchange regime. In this market, in addition to the central bank, other banks can buy and sell foreign currencies. Thus, exporters are availed with full option in managing their foreign exchange resources. But there are some restrictions on foreign exchange capital account.

It is assumed that this system will go on during the forecast period.

6-2-2 Trade Reforms

According to imports and exports regulations, imports are classified as "authorized", "conditional" and "prohibited" goods. Import of "authorized" goods requires no special license and permission, while import of "conditional" goods requires licensing by respective authorities. "Prohibited" goods are those which are forbidden by laws. As a whole, elimination of certification issuance procedures for almost all import items in conditional category was made more liberalization in foreign trade system.

To remove barriers to trade and restricting the smuggling, Ministry of Commerce announced a list of permitted intermediate goods and capital goods which are importable without foreign exchange transfer. To maintain coordination between foreign exchange and trade policies, the Ministry of Commerce revised the regulations pertaining on duties and tariffs. In this regard, downward adjustments were put into effect by a ratio of 5/22 as of March 21, 2002 and all import duties, taxes, and other charges (except commercial profit tax) were unified for the March 21, 2003 and a 4 percent duty rate was levied as a base for custom duties. New conditions were also set for using short-term credit lines (refinance) for importers. Thus, the import of spare parts and manufacturing machinery by private sector are authorized through this channel.

To promote nonoil exports, the Export Promotion Fund was established. To further liberalize the nonoil exports, export of all goods and services were exempted from surrender requirement (deposit) from March 21, 2002. This was a very important improvement in Iran's nonoil export. To compensate incurred losses of exporters due to exchange rate fluctuations, such as drastic fall of world prices of exported goods, some protections were defined through Export Guarantee Fund. Accompanying with these arrangements, Ministry of Commerce announced a new export rewards payments since 2002. Accordingly, goods with 10 to 100 percent of their domestic value-added, receive a reward of 1 to 3 percent of export values. In addition, 1 to 3 percent of export value shall be rewarded for marketing and export of new commodities. In another development, the comprehensive export promotion program was approved. The main targets of this program revolves around market competitiveness, reduction in public sector ownership, granting of explicit subsidies, reduction of tariffs and extension of banking facilities to export sector.

It is expected that this will be going on during the forecast period.

6-2-3 Foreign Investment

The "Law for Attraction and Protection of Foreign Investment" was revised in 2002. In the revised version, the maximum share of foreign investment in all economic sectors is set to 25 percent and in all activities to 35 percent. The oil sector is exempted from these limits.

It is expected that there will not be any major changes in Iran's foreign investment. That is, there is no expectation for capital account liberalization more than free zone areas.

6-2-4 Monetary Policy

The Money and Credit Council (MCC) approved the following policies to be implemented in 2004:

1. Public banks are authorized to extend up to 45% increase in outstanding of non-public sector facilities (loans) in 2004 without limitation of sectoral credit allocations. The share of various sectors out of total increase in the outstanding facilities of non-public sectors for commercial banks are as follows:

Sectoral allocation of credit to non-public sector (percent)	
Agriculture and water	25
Manufacturing and mining	32
Housing and construction	28
Exports	11
Domestic trade, services and miscellaneous	4
Total	100

2. The provisional (expected) profit (interest) rate for short-term deposits was determined at 7 percent, and for term investment deposits was set at 13-17 percent per annum for deposits for different maturities. Banks are allowed to set their rates on two, three, and four-year deposits within the above range.
3. Expected (minimum) banking loans interest rates for manufacturing, mining and export sectors were reduced by one percent compared to 2003 rates. The rates for other sectors in public banks are the same as before. Thus, it is also assumed that the loans' interest rates of banking system will be reduced by 1% in 2004 and remain unchanged in 2005.
4. To reach the targets of the 3rd Plan regarding inflation rate controls, Central Bank of Iran targeted liquidity growth within the range of 20-24 percent.
5. Central Bank of Iran was authorized to issue 5 trillion Rials participation papers7 with 17% minimum expected profit (interest) rate.
6. Reserve requirement ratios for public commercial banks, private banks and non-bank credit institutions unified equal to weighted average of reserve requirement ratios at the end of 2003 for different financial

[7] Participation paper is some kind of bond with guaranteed and determined minimum expected interest rate. This invention is used to finance investment projects and the final interest rate will be determined at maturity in some excess of minimum rate.

institutions. Central Bank of Iran is authorized to change this rate in the range of ±3%.

The above conditions are also adopted as policy assumptions for the forecast period.

6-2-5 Fiscal Policy

According to the 2004 government budget law, the following guidelines are drawn:

1. Increase in outstanding of directed banking facilities in 2004, is to be up to 3 trillion Rials. Public sector share of this increase is 25% and of cooperative and private sectors 75%. At least 65% percent of the share of cooperative and private sectors shall be distributed among deprived provinces.
2. Government is allowed to sell up to the ceiling of 16.1 billion us dollars in 2004. Moreover, the Central Bank is responsible for regulating foreign exchange market and management of balance of payments.
3. The accounting rate of government foreign exchange sale is based on inter-bank market rate. Government is allowed to provide and guarantee financial resources up to 9.3 billion dollars from foreign capital markets in form of project finance contracts or partnership.
4. Government is allowed to issue 10 trillion Rials participation papers[8] to accelerate the implementation of acquisition of non-financial assets. Of this amount, 2 trillion Rials is allocated to road and transportation sector, 2.5 trillion Rials to water resources and 5.5 trillion Rials to other projects. Public corporations are also allowed to rise up participation

[8] Participation paper is some kind of bond with guaranteed and determined minimum expected interest rate. This invention is used to finance investment projects and the final interest rate will be determined at maturity in some excess of minimum rate.

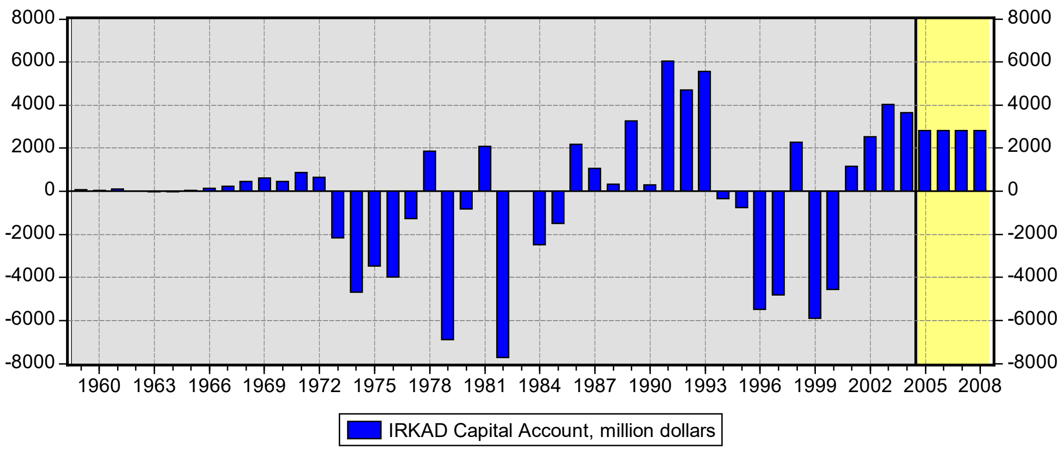
papers issuance to 3.2 trillion Rials through issuing participation papers for completing projects of acquisition of non-financial assets.

5. Government current and development expenditures are assumed to be according to approved amounts for 2004 and will grow by previous year growth rate in 2005.

It is also assumed that there will not be any important changes from the above picture of government budget structure in our forecast period. According to above presumptions, the amounts of assumed exogenous variables are as follows.

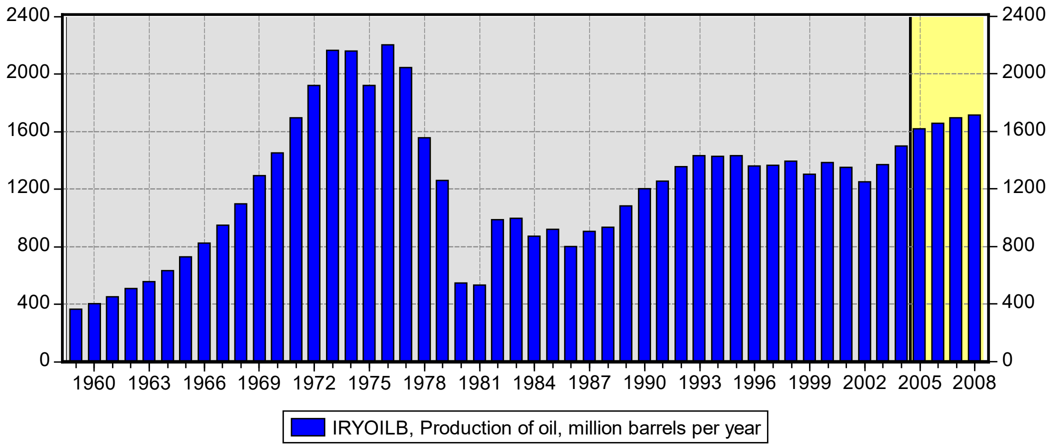
6-2-6 Capital Account

Historical capital account data of Iran is less reliable than other items in her balance of payments. For the 4 years period of 2005-2008, mean of 2001-2004 of this variable was adopted as forecast.



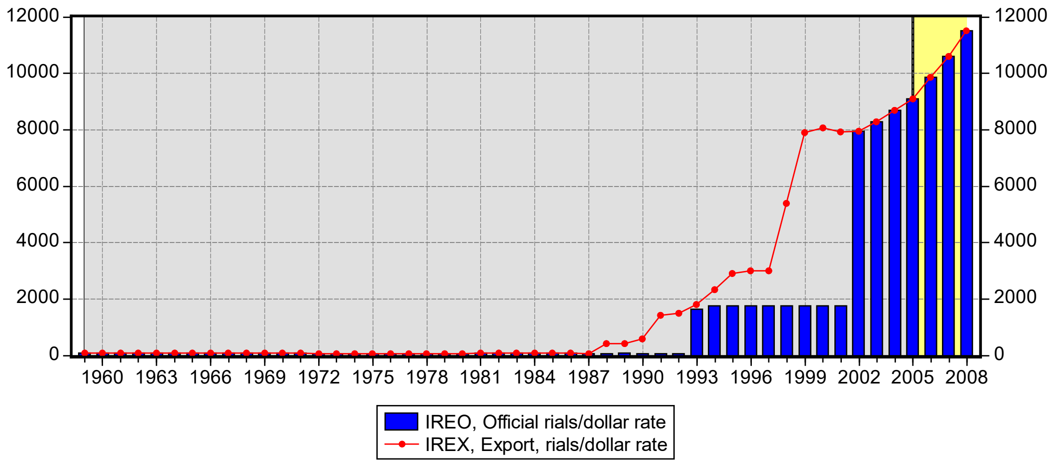
6-2-7 Production of Oil

Production of oil of Iran is predicted to be constant during the 4th plan (2005-2009), but production of gas condensate will be growing through South Pars investment in gas production.



6-2-8 Exchange Rates

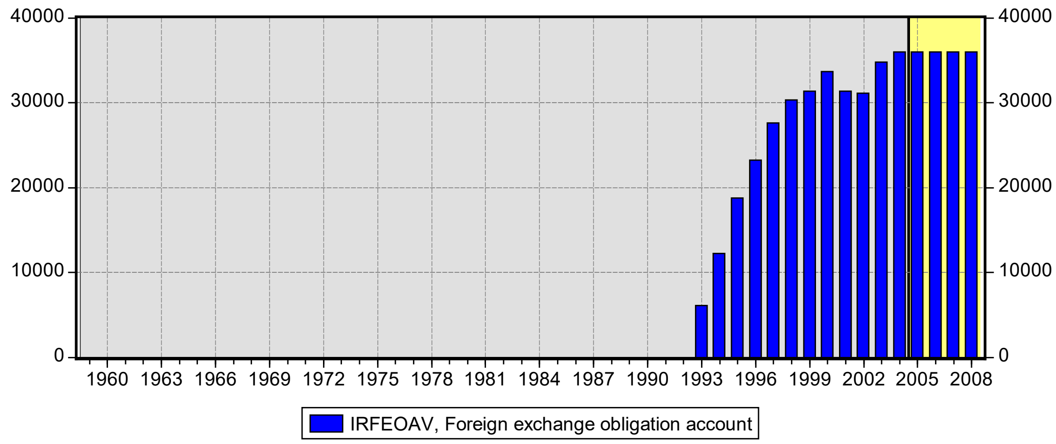
Official and export exchange rates for 2005 are unique, and are as government budget has estimated for this year. That is 4.5% increase to 2004. We assign this value plus 3.8% for Euro/dollar average appreciation we will get 8.3% average increase for rial depreciation against dollar for 2006 to 2008.



6-2-9 Foreign Exchange Obligation Account

This variable is predicted from Central Bank of Iran financial calculations.

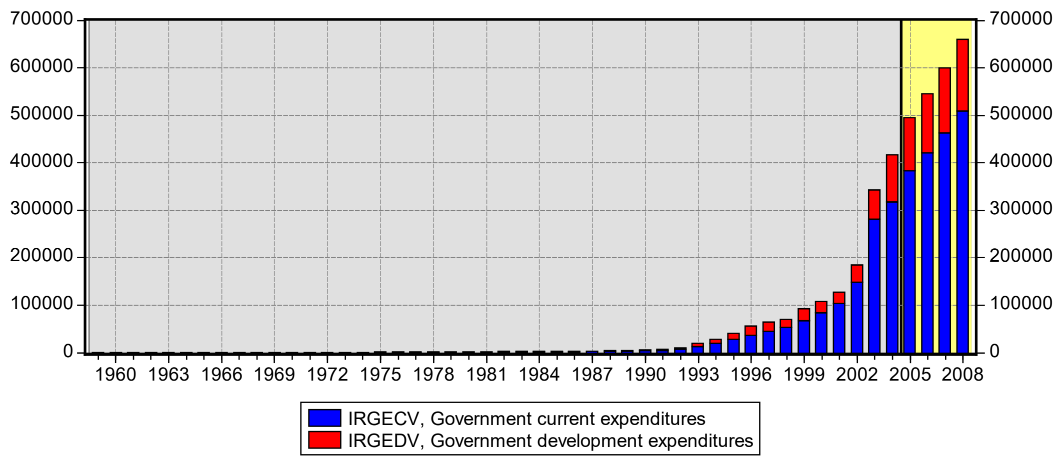
Billion Rials



6-2-10 Government Expenditures

According to 2005 budget law, the estimates of current and development government expenditures are used. Forecast of these two items for 2006-2008 are based on the growth rates of these items in the law of 4th development plan.

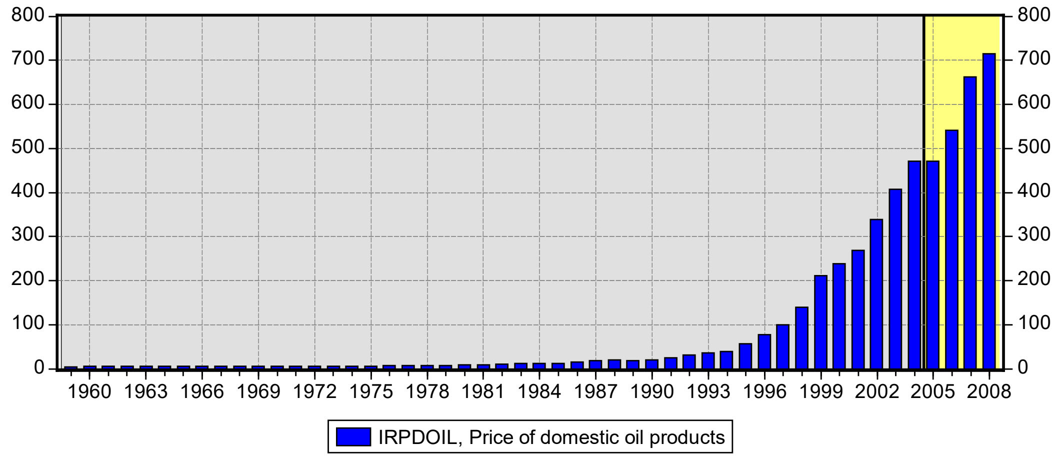
Billion Rials



6-2-11 Price of Domestic Oil Products

According to government budget law for the year 2005 the prices of 9 items including energy and (domestic) oil products will not increase for the first half of the 1384 (till October 2005). For the years 2006-2008 we adopt a growth rate of 2004 to 2003.

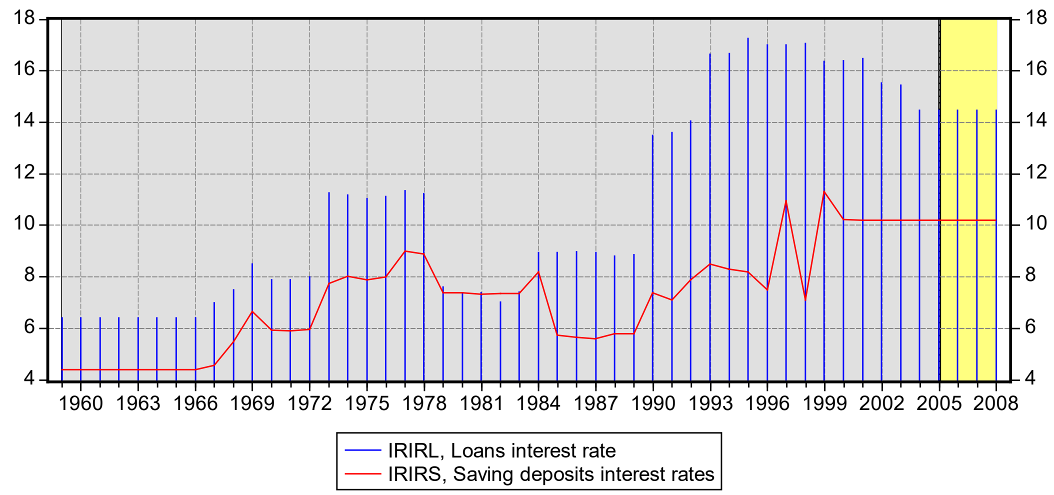
Index



6-2-12 Banking Loans and Saving Deposits Interest Rates

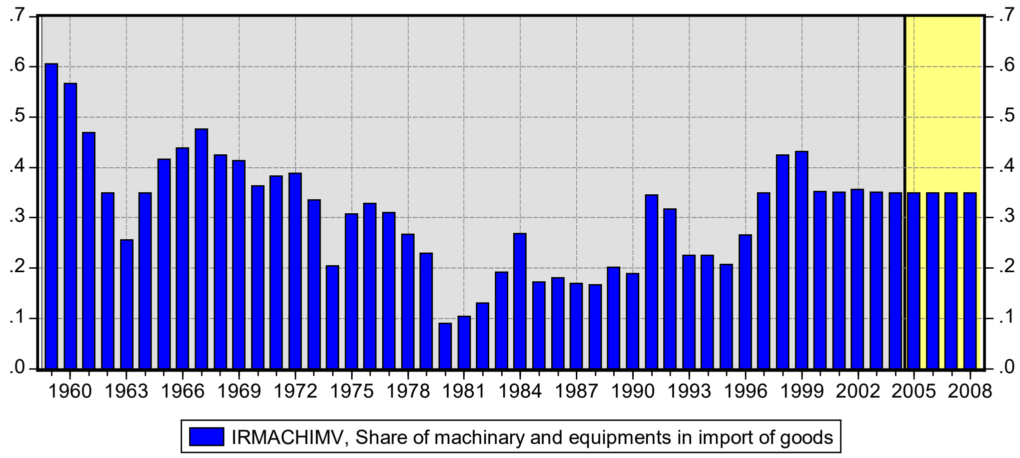
It is predicted that Central Bank of Iran will not reduce the loan and saving interest rates in 2005-2008 period. There was a 1% reduction in 2004 loans interest rates.

%



6-2-13 Share of Machinery and Equipment in Import of Goods

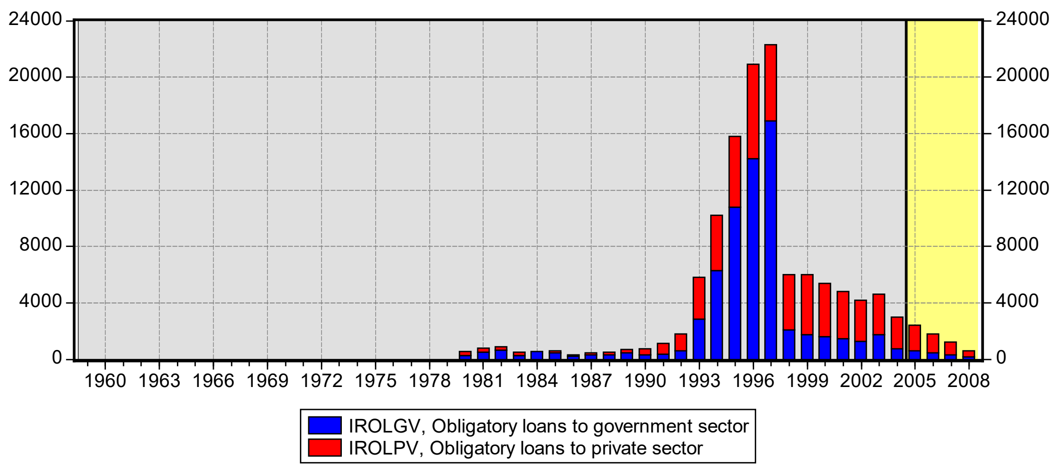
It is assumed that share of machinery and equipment in import of goods is the same as previous years for the period of 2005-2008.



6-2-14 Obligatory Loans Issued by Government Annual Budgets

According to annual government budget, the banking system is obliged to grant credit facilities to private and public sectors for exact purposes. According to the 4th development plan an annual decrease of %20 relative to 2004 should be occurred. The trend and forecast of these variables are as depicted by the following graph:

Billion Rials

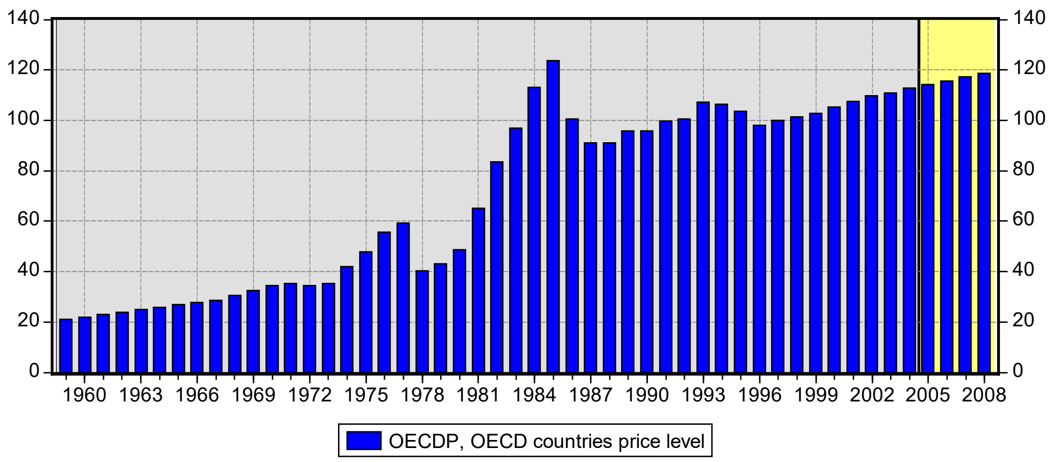


6-3 International Environment

It is assumed that foreign economic variables of our model are as follows. However, the main variable affect Iran's economy is crude oil price.

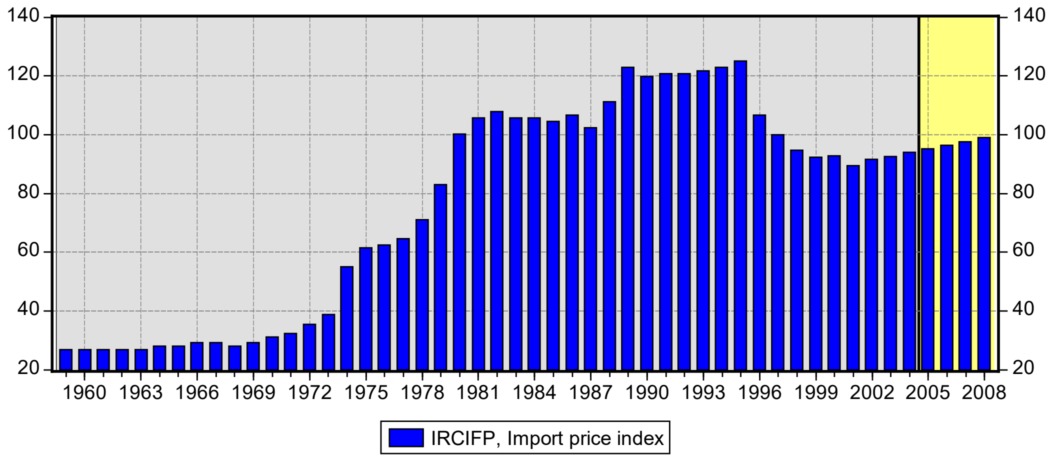
6-3-1 OECD Countries Prices

The ex-post values for this variable and forecast values are depicted by the following graph. The values for 2003-2005 are based on Summary of Project LINK World Economic Outlook for Germany; since this country is important commercial partner of Iran. 2006-2008 values are based on 2003-2005 inflation rates average.



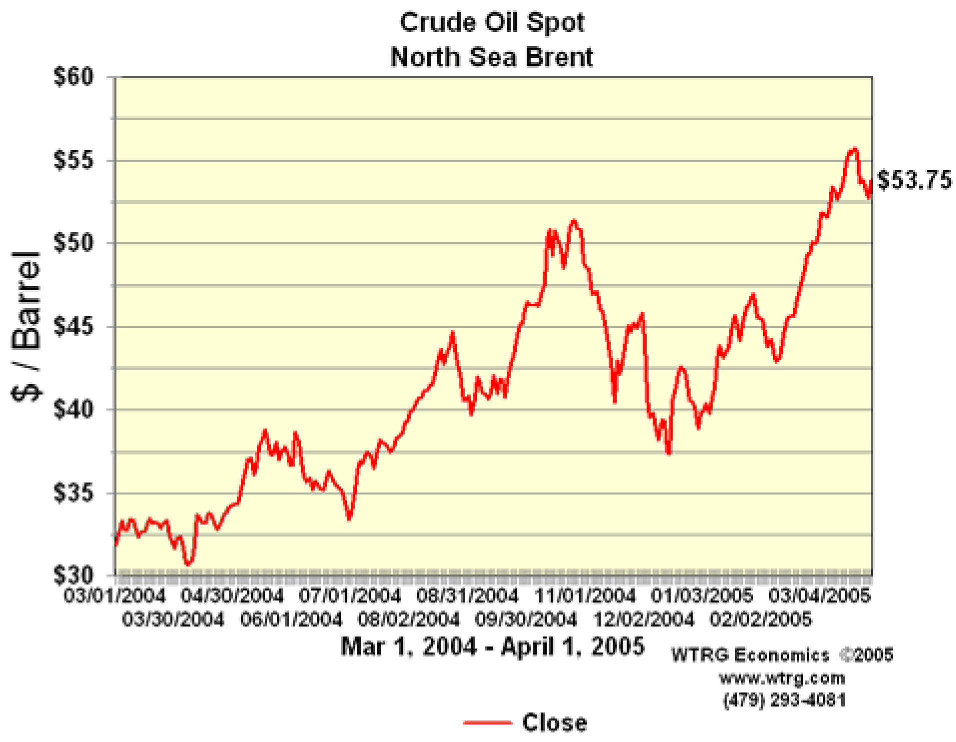
6-3-2 Import Price Index

This variable was predicted according to OECD price variable (OECDP).

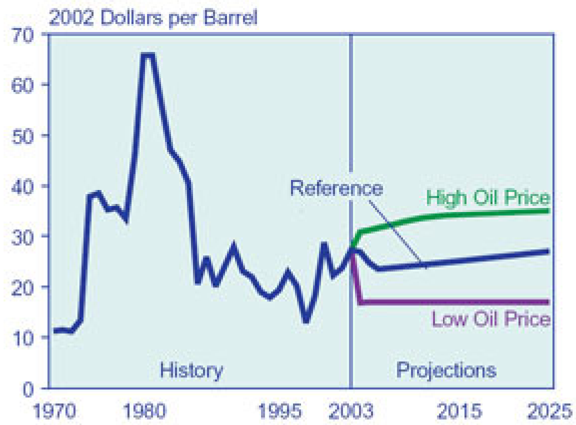


6-3-3 Price of Oil

Oil prices have been rising and different forecasts do not predict low oil prices. What are the chances for prices to return to $30 per barrel and what are the risks for even higher prices? This lost answer will be the most important variable in the Iran's economy. As the following graph shows, the oil price has an increasing pattern. But as a national model builder, we cannot forecast the future of this variable in our national framework and any assumption regarding crude oil price may highly affect the forecasts of Iran's economy. However, we assumed that increase in price of oils in 2005 will coincide with LINK Global Economic Outlook. That is the average international price of oil is assumed to be $38 per barrel of Brent crude oil in 2005 compared with an estimated average of $40 in 2004.

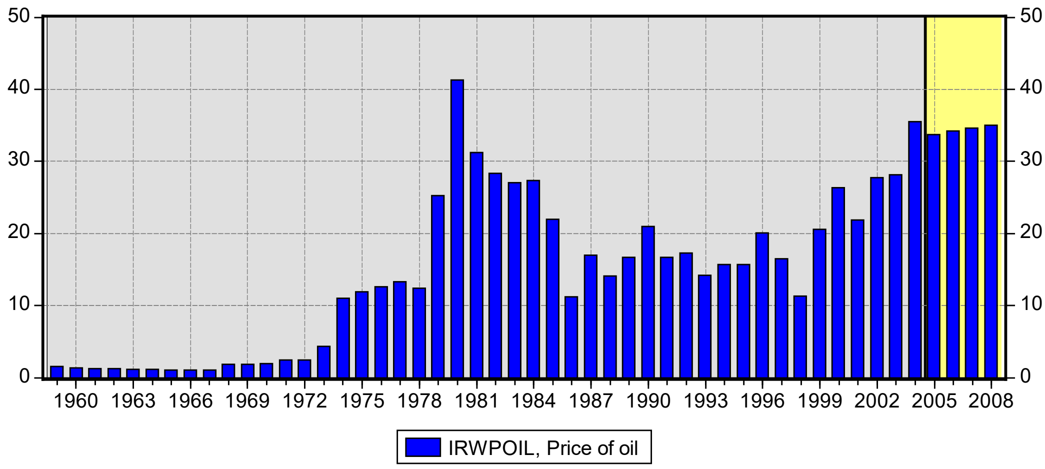


The forecasts for 2006-2008 are calculated from the growth rates of world oil prices by International Energy Outlook 2004 based on the following – high oil price- graph[9]:



[9] http://www.eia.doe.gov/oiaf/ieo/oil.html
Data are from the file: http://www.eia.doe.gov/oiaf/ieo/excel/figure_26data.xls

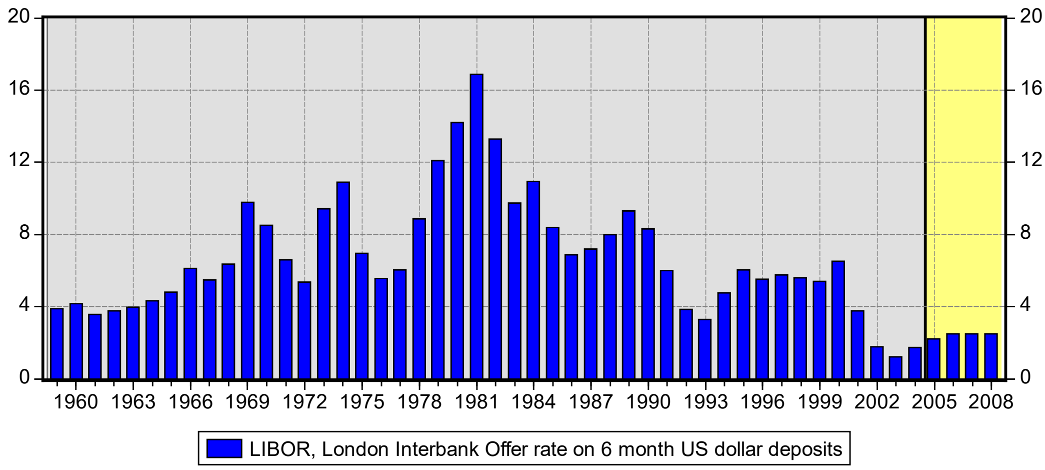
Dollars per barrel



6-3-4 International Interest Rate

LIBOR, London Interbank Offer Rates on 6 month US dollar deposits for 2004-2005 have been derived from International Financial Statistics (IFS) of International Monetary Fund (IMF). Value of 2.5% was assigned for 2006-2008 period.[10]

%



Assumed values are according to following table:

[10] This increase has been calculated from: http://www.essenhyp.com/en/investor_relations/forecast_meeting/forecast_meeting_22_03_05.php

Assumed values for all exogenous variables

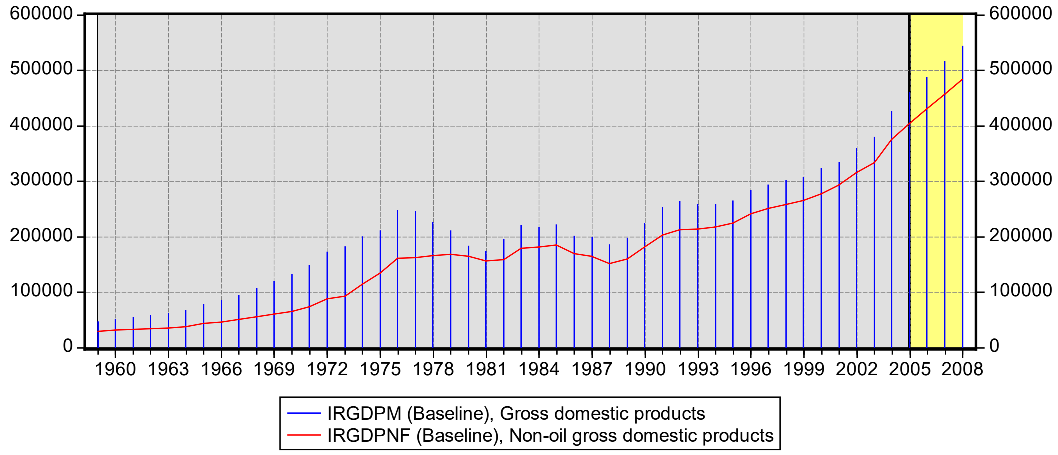
Variables	2003	2004	2005	2006	2007	2008
IRYEAR	1382	1383	1384	1385	1386	1387
IRKAD	4015	3633	2800	2800	2800	2800
OECDP	110.958	112.733	114.2	115.7	117.2	118.7
IRCIFP	92.465	93.945	95.165	96.4	97.6	98.9
IRWPOIL	28.10503	35.5	33.7	34.2	34.6	35
IRYOILB	1363.64	1490	1610	1650	1690	1710
IREO	8282	8700	9095	9850	10600	11500
IREX	8282	8700	9095	9850	10600	11500
LIBOR	1.23	1.73	2.23	2.5	2.5	2.5
IRFEOAV	34755.4	35955.7	35955.7	35955.7	35955.7	35955.7
IRGECV	282137.5	317672.9	383000	421300	463430	509800
IRGEDV	60986.6	99089.8	113000	124300	136730	150400
IRPDOIL	407.3479	470.47	470.47	541	662	715
IRIRL	15.4597	14.4597	14.4597	14.4597	14.4597	14.4597
IRIRS	10.2	10.2	10.2	10.2	10.2	10.2
IRMACHIMV	0.35049	0.35	0.35	0.35	0.35	0.35
IROLGV	1750	750	600	450	300	150
IROLPV	2860	2250	1800	1350	900	450

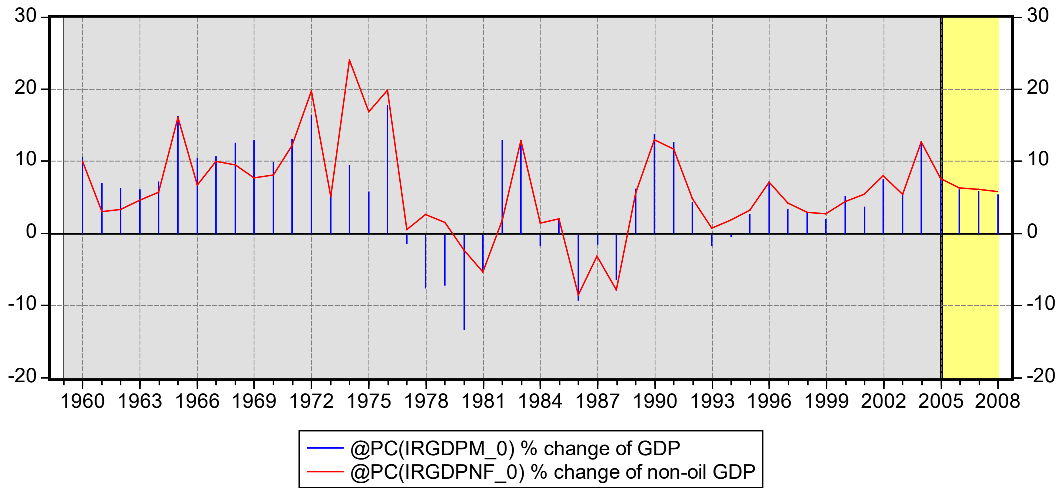
6-4 Forecast Summary

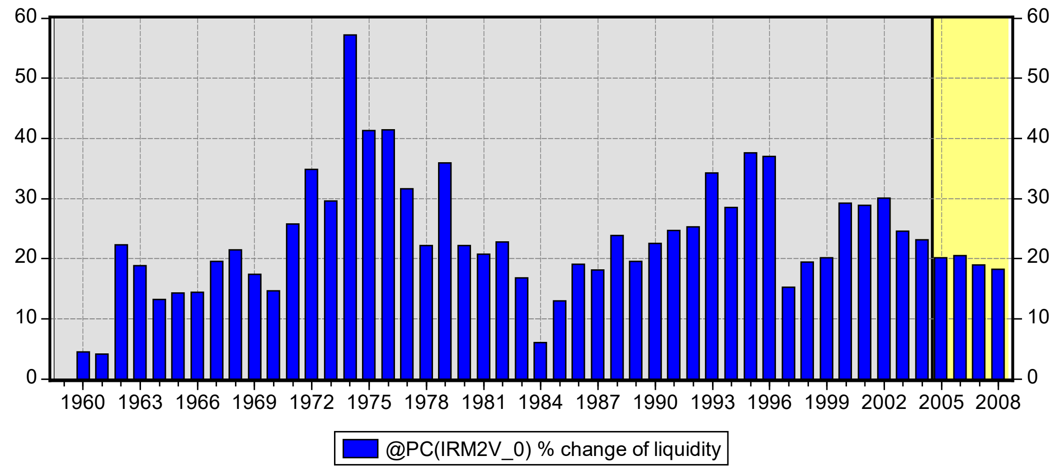
The following table shows the forecast of the Macro econometric Model of Iran Version 6.1 for some selected variables. As it mentioned earlier the oil price forecast is a major and determinant factor in Iran's economy prediction. This will be the main sources of over/under forecasting of the model.

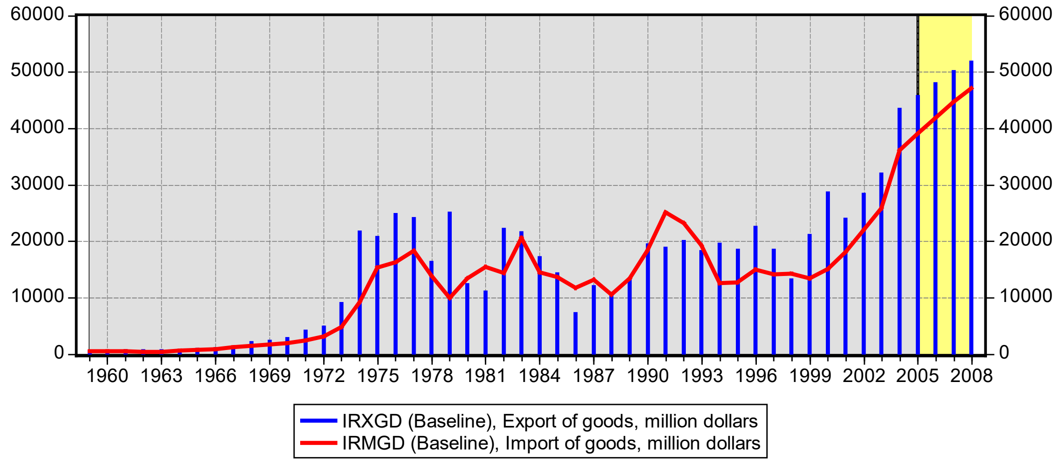
Forecast of the main Iran's macroeconomic variables

Christian Year		2003	2004	2005	2006	2007	2008
Iranian year		1382	1383	1384	1385	1386	1387
Private consumption at constant prices, billion Rials		204374	223818	240620	257294	274714	292648
	% ch		9.5%	7.5%	6.9%	6.8%	6.5%
Investment at constant prices, billion Rials		128620	170587	188167	201090	213760	224464
	% ch		32.6%	10.3%	6.9%	6.3%	5.0%
GDP at market price at constant prices, billion Rials		378521	426117	459234	486822	515156	542794
	% ch		12.6%	7.8%	6.0%	5.8%	5.4%
Nonoil GDP at market price, constant prices, billion Rials		333259	375588	404203	430016	456638	483347
	% ch		12.7%	7.6%	6.4%	6.2%	5.8%
Employment, thousands		18695	19738	20587	21425	22307	23256
	% ch		5.6%	4.3%	4.1%	4.1%	4.3%
Unemployment, thousands		2725.3	2678.7	2925.8	3293.7	3741	4259.5
	% ch		-1.7%	9.2%	12.6%	13.6%	13.9%
Non-organized market interest rate		60.6	70.8	67.6	57.4	54.5	65.9
	% ch		16.8%	-4.5%	-15.1%	-5.1%	20.9%
Liquidity, billion Rials		519939	640461	769380	927309	1103274	1304714
	% ch		23.2%	20.1%	20.5%	19.0%	18.3%
Import of goods, million Dollars		25873	36166	39112	41904	44795	47141
	% ch		39.8%	8.1%	7.1%	6.9%	5.2%
Import of services, million Dollars		9860	11374	12321	13050	13826	14615
	% ch		15.4%	8.3%	5.9%	5.9%	5.7%
Export of oil, million barrels/year		938.2	1056.8	1169.3	1206.9	1244.4	1263.2
	% ch		12.6%	10.6%	3.2%	3.1%	1.5%
Export of nonoil goods, million Dollars		5458.1	5799.1	6146.1	6543.9	6984.2	7450.7
	% ch		6.2%	6.0%	6.5%	6.7%	6.7%
Export of services, million Dollars		6071	7205	8229	9282	10402	11610
	% ch		18.7%	14.2%	12.8%	12.1%	11.6%
Export of oil, million Dollars		26368	37515	39407	41275	43056	44211
	% ch		42.3%	5.0%	4.7%	4.3%	2.7%
Current account, million Dollars		3481	4011	3351	3122	2765	2427
	% ch		15.2%	-16.5%	-6.8%	-11.4%	-12.2%
Balance of payments, million Dollars		4706	7189.5	4757	4615.5	4375.9	4161.1
	% ch		52.8%	-33.8%	-3.0%	-5.2%	-4.9%
Terms of trade, billion Rials		17726	46201	47275	49508	51782	52607
	% ch		160.6%	2.3%	4.7%	4.6%	1.6%
GDP implicit price deflator		2.96	3.26	3.49	3.77	4.06	4.42
	% ch		10.1%	7.1%	8.0%	7.7%	8.9%
Import implicit price deflator		3.48	3.17	3.27	3.53	3.78	4.12
	% ch		-8.9%	3.2%	8.0%	7.1%	9.0%
Export implicit price deflator		4.49	5.2	5.19	5.56	5.92	6.36
	% ch		15.8%	-0.2%	7.1%	6.5%	7.4%
Consumer price index		242.6	260.3	287.3	311	334.7	368.4
	% ch		7.3%	10.4%	8.2%	7.6%	10.1%
Wholesale price index		216.5	224.4	241.1	257.7	274.2	297.4
	% ch		3.6%	7.4%	6.9%	6.4%	8.5%

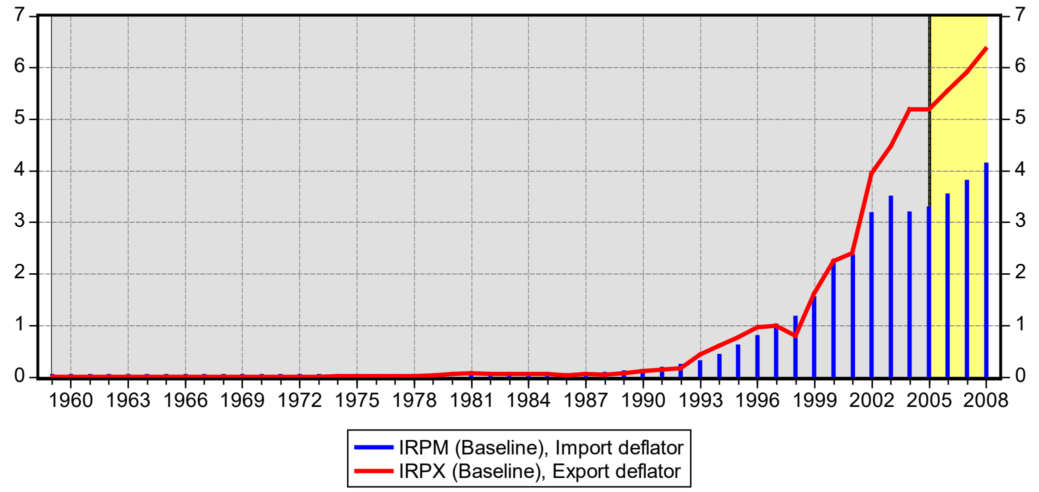

600000
500000
400000
300000
200000
100000
0
1960 1963 1966 1969 1972 1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005 2008
IRGDPM (Baseline), Gross domestic products
IRGDPNF (Baseline), Non-oil gross domestic products


30
20
10
0
-10
-20
1960 1963 1966 1969 1972 1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005 2008
@PC(IRGDPM_0) % change of GDP
@PC(IRGDPNF_0) % change of non-oil GDP

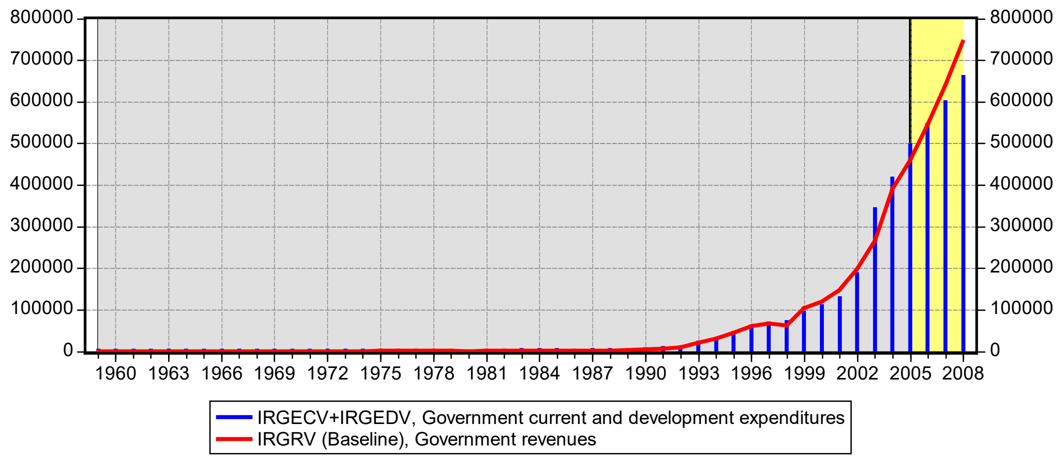

60
50
40
30
20
10
0
1960 1963 1966 1969 1972 1975 1978 1981 1984 1987 1990 1993 1996 1999 2002 2005 2008
@PC(IRM2V_0) % change of liquidity



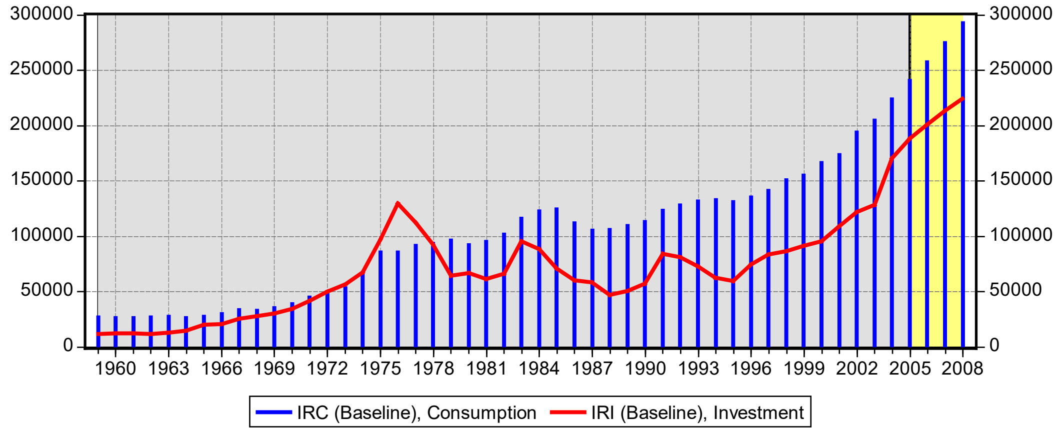
60000
50000
40000
30000
20000
10000
0
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008
IRXGD (Baseline), Export of goods, million dollars
IRMGD (Baseline), Import of goods, million dollars



7
6
5
4
3
2
1
0
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008
IRPM (Baseline), Import deflator
IRPX (Baseline), Export deflator



800000
700000
600000
500000
400000
300000
200000
100000
0
1960
1963
1966
1969
1972
1975
1978
1981
1984
1987
1990
1993
1996
1999
2002
2005
2008
IRGECV+IRGEDV, Government current and development expenditures
IRGRV (Baseline), Government revenues



6-5 Policy Issues and Uncertainty

Iran's economy has experienced many qualitative changes during the last 3 decades and in this regard, model building in an econometric framework based on historical data may have some weaknesses in comparison with other economies. This problem comes from unstable and non-disciplinary volatile changes in economic variables caused some events by structural changes of the economy.

Price of crude oil has a very important role in Iran's economy. Using accurate forecast of this exogenous variable in the national model will create more accurate forecast for other variables engaged. The applied forecast values for this variable are not desirable figures, because the international predicted figures themselves suffer from qualitative changes in the oil market.

Future structural changes of Iran's economy are not predictable. These changes belong to the category of qualitative data and the amount of their effects on the economy which are not simply measurable. Political environment effects are not negligible in the economy. However, it is predictable that some political changes as scheduled presidential election in 2005 with un-measurable effects will be occurred in Iran. In this regard, the positions of United States and Europe about Iran are important, especially in the case of US sanctions and regional turmoil in Iraq and Afghanistan.

However, the above reasons will be the main sources of discrepancies between actual and predicted values of the model for Iran's economy.

Appendix

Computer Programs

All calculations have been done by EViews (Econometric Views) 4.1. The following programs show the necessary technical information about the ways that auxiliary variables and calculations have been computed. The following programs have been coded for Eviews 4.1:

A-1 Program CALC14.PRG

```
'This program generates all necessary variables
 SMPL  1959 2003
'Conversion of ton to barrel for records; not for calculations
'IRXOILB=IRXOIL*7.3*0.001
'IRYOILB=IRYOIL*7.3*0.001
GENR IRWPOIL=IRXOILD/IRXOILB
GENR IRDISV=IRIIV+IRGDPEOV
GENR IRDIS=IRII+IRGDPEO
GENR IRSBD=IRXSD-IRMSD
GENR IRFYSBD=IRXFYSD-IRMFYSD
GENR IRNFSBD=IRXNFSD-IRMNFSD
GENR IRPGDIM=IRGDIMV/IRGDIM
```

```
GENR IRPC=IRCV/IRC
GENR IRPG=IRGV/IRG
GENR IRPGDPM=IRGDPMV/IRGDPM
GENR IRPGDPF=IRGDPFV/IRGDPF
GENR IRPGDIM=IRGDIMV/IRGDIM
GENR IRPGNIM=IRGNIMV/IRGNIM
GENR IRPGDPNF=IRGDPNFV/IRGDPNF
GENR IRPGNPM=IRGNPMV/IRGNPM
GENR IRPI=IRIV/IRI
GENR IRPA=IRADV/IRAS
GENR IRPM=IRMV/IRM
GENR IRPVAOIL=IRVAOILV/IRVAOIL
GENR IRPX=IRXV/IRX
GENR IRPDIS=IRDISV/IRDIS
GENR IRPGDPEO=IRGDPEOV/IRGDPEO
GENR IRPII=IRIIV/IRII
GENR IRPNIT=IRNITV/IRNIT
GENR IRPIT=IRITV/IRIT
GENR IRPSUB=IRSUBV/IRSUB
GENR IRPNNIF=IRNNIFV/IRNNIF
GENR IRPIP=IRIPV/IRIP
GENR IRPIG=IRIGV/IRIG
GENR IRPCCA=IRCCAV/IRCCA
GENR IRPNFY=IRNFYV/IRNFY
GENR IRPBOT=IRBOTV/IRBOT
GENR IRPXFY=IRXFYV/IRXFY
GENR IRPMFY=IRMFYV/IRMFY
GENR IRPGNS=IRGNSV/IRGNS
GENR IRPNNS=IRNNSV/IRNNS
GENR IRPINPUT=IRINPUTV/IRINPUT
```

```
GENR IROUTPUT=IRINPUT+IRGDPF
GENR IRPOUTPUT=IROUTPUTV/IROUTPUT
GENR IRPMG = IRMGV  / IRMG
GENR IRPMNFS = IRMNFSV  / IRMNFS
GENR IRPXOIL = IRXOILV  / IRXOIL
GENR IRPXNOILG = IRXNOILGV  / IRXNOILG
GENR IRPXNFS = IRXNFSV  / IRXNFS
GENR IRWINDCPI=IRWIND/IRCPI
GENR IRWINDPGDPM=IRWIND/IRPGDPM
GENR IRWINDPGDPNF=IRWIND/IRPGDPNF
GENR IRWINDWPID=IRWIND/IRWPID
GENR IRUNEMPR=IRUNEMP/IRPOPA*100
GENR IRINFCPI=D(IRCPI)/IRCPI(-1)
GENR IRINFWPI=D(IRWPI)/IRWPI(-1)
GENR  IRXGNODFCPI=IRXGNOD/FCPI
GENR  IRXGNODOP=IRXGNOD/OECDP
GENR  IRXNFSDOP=IRXNFSD/OECDP
GENR IRMSDFPX=IRMSD/FPX
GENR IRXSDFCPI=IRXSD/FCPI
GENR IRMGDFPX=IRMGD/FPX
GENR IRMNFSDCIFP=IRMNFSD/IRCIFP
GENR IRMGDCIFP=IRMGD/IRCIFP
GENR IRMGCDCIFP=IRMGCD/IRCIFP
GENR IRGMTR=(IRGMTV*1000)/(IRMGD*(1-(CIFFOBF-
1)*IRD8187)*CIFFOBF)
GENR CIFFOBA8187=(CIFFOBF-1)*IRD8187*IRMGD
GENR CIFFOBAC8187=(CIFFOBF-1)*IRD8187*IRMGCD
GENR IRYD = IRGDPNF+IRNFY-IRCCA-IRGRTDV/IRPIT
GENR IRYDV = IRGDPNFV+IRNFYV -IRCCAV-IRGRTDV
GENR IRPYD = IRYDV/IRYD
```

```
GENR IRSPV=IRYDV-IRCV
GENR IRSP=IRYD-IRC
GENR IRPSP=IRSPV/IRSP
GENR IRPGDEM=IRGDEMV/IRGDEM
GENR IRM2NFAD=1000*IRM2NFAV*((1-IRD93-IRD90-IRD91-IRD92
)/IREO +IRD93/1748 +IRD90/221.89 +IRD91/351.9+IRD92/641.2)
 GENR IRM2PGDPM=IRM2V/IRPGDPM
GENR IRM2CPI=IRM2V/IRCPI
GENR IRDDVPGDPM=IRDDV/IRPGDPM
GENR IRSDVPGDPM=IRSDV/IRPGDPM
GENR IRCUVPGDPM=IRCUV/IRPGDPM
GENR IRM2NPVPGDPM=IRM2NPV/IRPGDPM
GENR IRM2NGGV= IRGBDVC +IRFEOAV +IROLVC
GENR IRM2NGSV= IRM2NGV - IRM2NGGV
GENR IRM2NGSVPGDPM= IRM2NGSV/IRPGDPM
 GENR IRWARCD=IRWARCDV/IRPCCA
GENR IRWARED=IRWAREDV/IRPCCA
GENR IRWARMD=IRWARMDV/IRWPI
GENR IRWARD=IRWARCD+IRWARED+IRWARMD

SMPL 1959 1959
GENR IRK=IRI-IRCCA
GENR IRKV=IRIV-IRCCAV
GENR IRIIVC=IRIIV
GENR IRIIC=IRII
SMPL 1960 2005
GENR IRK=IRK(-1)+IRI-IRCCA
GENR IRKV=IRKV(-1)*(1+(IRPI-IRPI(-1))/IRPI(-1))+IRIV-IRCCAV

SMPL 1959 2005
```

```
GENR IRPK=IRKV/IRK

SMPL 1959 1959
GENR IRBOPDC=IRBOPD
GENR IRBOPEODC=IRBOPEOD
GENR IRKADC=IRKAD
GENR IRCADC=IRCAD
GENR IRTBDC=IRTBD
GENR IRSBDC=IRSBD
GENR IRNTRDC=IRNTRD
GENR IRFYSBDC=IRFYSBD
GENR IRNFSBDC=IRNFSBD
GENR CIFFOBA8187C=CIFFOBA8187
GENR IRGBDVC= - IRGBDV
GENR IROLVC= IROLV
GENR IROLPVC= IROLPV
GENR IROLGVC= IROLGV
GENR IRGEFIVC=IRGEFIV
GENR IRGEFIDC=IRGEFIV/IREO*1000

SMPL 1960 2005
GENR IRBOPDC=IRBOPDC(-1) + IRBOPD
GENR IRBOPEODC=IRBOPEODC(-1)+IRBOPEOD
GENR IRKADC=IRKADC(-1)+IRKAD
GENR IRCADC=IRCADC(-1)+IRCAD
GENR IRTBDC=IRTBDC(-1)+IRTBD
GENR IRSBDC=IRSBDC(-1)+IRSBD
GENR IRNTRDC=IRNTRDC(-1)+IRNTRD
GENR IRFYSBDC=IRFYSBDC(-1)+IRFYSBD
GENR IRNFSBDC=IRNFSBDC(-1)+IRNFSBD
```

```
GENR CIFFOBA8187C=CIFFOBA8187C(-1)+CIFFOBA8187
GENR IRGBDVC=IRGBDVC(-1)  - IRGBDV
GENR IROLVC=IROLVC(-1)+IROLV
GENR IROLPVC=IROLPVC(-1)+IROLPV
GENR IROLGVC=IROLGVC(-1)+IROLGV
GENR IRGEFIVC=IRGEFIVC(-1)+IRGEFIV
GENR IRGEFIDC=IRGEFIDC(-1)+IRGEFIV/IREO*1000

SMPL 1959 2005
GENR IRPOPAPOP=IRPOPA/IRPOP

SMPL 1959 1959
GENR IRINFCPI=(4.37-3.87)/3.87
GENR IRINFWPI=(4.8-4.6)/4.6
SMPL 1959 2005
```

A-2 Program EVAL200.PRG

'This program evaluates the ex-post simulation of the MODEL_200 by generating various simulation statistics. The evaluations may be applied to dynamic, static and fitted (static simulation with no-interaction) simulations.

'Note: In model-solve tab tick baseline scenario as active scenario

```
'Initialization:
!START=1959
!END=2003
!LAGSTRUCTURE=1
%MODNAME="Ver6_MODEL_200"
%SYSNAME="SYS_200"
!NVAR=200
!NROWS=!NVAR+2
%SIMULATIONID="_0"
!NSTAT=23
!NCOLS=!NSTAT+3
!MAXIT=50000
!PRECISION=1E-07
!MED=0
!VARIANCE=0
!NOBS= !END-!START+1
 SUBROUTINE LOCAL MEDIAN(SERIES DUMMY ,SCALAR !MED,
SCALAR !NOBS)
!NOBS1= !NOBS-1
FOR !I=1 TO !NOBS1
```

```
    !M=!I+1
    FOR !J=!M TO !NOBS
        IF DUMMY(!I) > DUMMY(!J) THEN !D=DUMMY(!I)
        DUMMY(!I)=DUMMY(!J)
        DUMMY(!J)=!D
        ELSE
        ENDIF
    NEXT !I
NEXT !J
!M=0
FOR !N=0 TO !NOBS
    !M=!M+2
    IF !M>=!NOBS THEN EXITLOOP
    ENDIF
NEXT !N
IF !M=!NOBS THEN !K= !NOBS/2
!MED=(DUMMY(!K)+DUMMY(!K+1))/2
ELSE
!K= !NOBS1/2
!MED=DUMMY(!K+1)
ENDIF
ENDSUB

SMPL !START !END
TABLE(!NROWS,!NCOLS) SIMSTAT
SETCOLWIDTH(SIMSTAT,1,5)
SETCOLWIDTH(SIMSTAT,2,16)
SETCOLWIDTH(SIMSTAT,3,16)
SETCOLWIDTH(SIMSTAT,4,14)
SETCOLWIDTH(SIMSTAT,5,14)
```

```
FOR !J=6 TO !NCOLS
       SETCOLWIDTH(SIMSTAT,!J,16)
NEXT !J
FOR !J=1 TO !NCOLS
      SETCELL(SIMSTAT,1,!J,0,"C")
NEXT !J
SETLINE(SIMSTAT,2)
FOR !I=3 TO !NROWS
        %NUMBER=@STR(!I-2)+" "
        SETCELL(SIMSTAT,!I,1,%NUMBER,"R",4.0)
        SETCELL(SIMSTAT,!I,2,0,"L")
        SETCELL(SIMSTAT,!I,3,0,"L")
        SETCELL(SIMSTAT,!I,4,0,"R",14.0)
        SETCELL(SIMSTAT,!I,5,0,"R",14.0)
        FOR !J= 6 TO !NCOLS
             SETCELL(SIMSTAT,!I,!J,0,"R",16.5)
        NEXT !J
NEXT !I
SHOW SIMSTAT
GROUP TEMPGROUP
DELETE TEMPGROUP
SOLVE(M=!MAXIT,C=!PRECISION) %MODNAME
{%MODNAME}.MAKEGROUP(A,N) TEMPGROUP @ENDOG
 TABLE TEMPTAB
DELETE TEMPTAB
FREEZE(TEMPTAB) TEMPGROUP

FOR   !I=1 TO !NVAR
      SIMSTAT(!I+2,3)=TEMPTAB(1,!I+1)+"_0"
      SIMSTAT(!I+2,2)=TEMPTAB(1,!I+1)
```

```
""     SIMSTAT(!I+2,2)=@MID(TEMPTAB(1,!I+1),3,14)
NEXT !I
SIMSTAT(1,1)="No."
SIMSTAT(1,2)="Actual"
SIMSTAT(1,3)="Simulated"
SIMSTAT(1,4)="Observations"
SIMSTAT(1,5)="Non_zero obs"
SIMSTAT(1,6)="Mean actual"
SIMSTAT(1,7)="Mean simulated"
SIMSTAT(1,8)="Mean error"
SIMSTAT(1,9)="VAR(error)"
SIMSTAT(1,10)="SDV(error)"
SIMSTAT(1,11)="Median(error)"
SIMSTAT(1,12)="Max(error)"
SIMSTAT(1,13)="Min(error)"
SIMSTAT(1,14)="Skewness(error)"
SIMSTAT(1,15)="Kurtosis(error)"
SIMSTAT(1,16)="RMS Error"
SIMSTAT(1,17)="M percent error"
SIMSTAT(1,18)="RMS percent error"
SIMSTAT(1,19)="M absolute error"
SIMSTAT(1,20)="MA percent error"
SIMSTAT(1,21)="Corr(act,sim)"
SIMSTAT(1,22)="Cov(act,sim)"
SIMSTAT(1,23)="Theil U-Stat."
SIMSTAT(1,24)="Theil U-Bias"
SIMSTAT(1,25)="Theil U-Var"
SIMSTAT(1,26)="Theil U-Cov"
FOR !I=3 TO !NROWS
    SMPL !START !END
```

```
%ACTUAL=SIMSTAT(!I,2)
%SIMULATED=SIMSTAT(!I,3)
%ERROR="E_"+%ACTUAL
%PERROR="P_"+%ACTUAL
%APERROR="A_"+%ACTUAL
SERIES %ACTUAL
SERIES  %SIMULATED
SERIES  %ERROR
GENR {%ERROR}={%SIMULATED}-{%ACTUAL}
SIMSTAT(!I,4)=@OBS({%ACTUAL})
!AUX0=@OBS({%ACTUAL})
SMPL !START !END  IF ({%ACTUAL})<>0
SIMSTAT(!I,5)=@OBS({%ACTUAL})
SMPL !START !END  IF ({%ACTUAL})>0
!AUX1=@OBS({%ACTUAL})
IF !AUX1=!AUX0 THEN
GENR {%PERROR}={%ERROR} /{%ACTUAL}
GENR {%APERROR}=ABS({%ERROR} /{%ACTUAL})
ELSE
GENR {%PERROR}=NA
GENR {%APERROR}=NA
ENDIF
SMPL !START !END
GENR TEMP1=({%ERROR}-@MEAN({%ERROR}))^3
GENR TEMP2=({%ERROR}-@MEAN({%ERROR}))^4
SIMSTAT(!I,6)=@MEAN({%ACTUAL})
SIMSTAT(!I,7)=@MEAN({%SIMULATED})
SIMSTAT(!I,8)=@MEAN({%ERROR})
```

```
!VARIANCE=@VAR({%ERROR})*@OBS({%ERROR})/(@OBS({%E
RROR})-1)
      SIMSTAT(!I,9)=!VARIANCE
      SIMSTAT(!I,10)=SQR(!VARIANCE)
      CALL MEDIAN({%ERROR}, !MED, !NOBS)
      SIMSTAT(!I,11)=!MED
      GENR {%ERROR}={%SIMULATED}-{%ACTUAL}
      SIMSTAT(!I,12)=@MAX({%ERROR})
      SIMSTAT(!I,13)=@MIN({%ERROR})
      IF !VARIANCE<>0 THEN
      SIMSTAT(!I,14)=
@MEAN(TEMP1)/(!VARIANCE^1.5)*@OBS({%ERROR})/(@OBS({%
ERROR})-1)

SIMSTAT(!I,15)=@MEAN(TEMP2)/(!VARIANCE^2)*@OBS({%ERRO
R})/(@OBS({%ERROR})-1)
      ELSE
      ENDIF
      SIMSTAT(!I,16)=SQR(
@SUMSQ({%ERROR})/@OBS({%ERROR}))
      SMPL !START !END IF ({%ACTUAL})<>0
      IF !AUX1=!AUX0 THEN
      SIMSTAT(!I,17)=@MEAN({%PERROR})

SIMSTAT(!I,18)=SQR(@SUMSQ({%PERROR})/@OBS({%PERROR}))
       ELSE
      SIMSTAT(!I,17)="NA"
      SIMSTAT(!I,18)="NA"
      ENDIF
```

```
SMPL !START !END
SIMSTAT(!I,19)=@SUM(ABS({%ERROR}))/@OBS({%ERROR})
SMPL !START !END IF ({%ACTUAL})<>0
IF !AUX1=!AUX0 THEN

SIMSTAT(!I,20)=@SUM(ABS({%APERROR}))/@OBS({%ERROR})
ELSE
SIMSTAT(!I,20)="NA"
ENDIF
SMPL !START !END
SIMSTAT(!I,21)=@COR({%ACTUAL},{%SIMULATED})
SIMSTAT(!I,22)=@COV({%ACTUAL},{%SIMULATED})
SIMSTAT(!I,23)=SQR(
@SUMSQ({%ERROR})/@OBS({%ERROR}))  /
(SQR(@SUMSQ({%SIMULATED})/@OBS({%ERROR})) +
SQR(@SUMSQ({%ACTUAL})/@OBS({%ERROR})) )
IF !VARIANCE>0.00001 THEN
SIMSTAT(!I,24)= ( (@MEAN({%SIMULATED})-
@MEAN({%ACTUAL}))^2 ) /  (
@SUMSQ({%ERROR})/@OBS({%ERROR}) )
SIMSTAT(!I,25)= ( (SQR(@VAR({%SIMULATED}))-
SQR(@VAR({%ACTUAL})))^2 ) /(
@SUMSQ({%ERROR})/@OBS({%ERROR}) )
SIMSTAT(!I,26)= ( 2*(1-
@COR({%SIMULATED},{%ACTUAL}))*(
SQR(@VAR({%SIMULATED}))*SQR(@VAR({%ACTUAL})))  ) /  (
@SUMSQ({%ERROR})/@OBS({%ERROR}) )
ELSE
SIMSTAT(!I,24)=0
SIMSTAT(!I,25)=0
```

```
      SIMSTAT(!I,26)=1
      ENDIF
'     DELETE {%SIMULATED}
      DELETE {%ERROR}
      DELETE {%PERROR}
      DELETE {%APERROR}
NEXT  !I
SETLINE (SIMSTAT,!NROWS+1)
SHOW SIMSTAT
DELETE TEMP1 TEMP2
DELETE TEMPTAB
```

A-3 Program EVAL200FORCASTABILITY.PRG

```
'This program evaluates the ex-post simulation of the MODEL_200 by
generating various simulation statistics.  The evaluation is applied to
dynamic short term simulations with different time periods.

'Initialization:
!START=1959
!END=2003
!LAGSTRUCTURE=1
%MODNAME="Ver6_MODEL_200"
%SYSNAME="SYS_200"
!NVAR=200
!NROWS=!NVAR+2
%SIMULATIONID="_0"
!NSTAT=23
!NCOLS=!NSTAT+3
!MAXIT=50000
!PRECISION=1E-07
!MED=0
!VARIANCE=0
!NOBS= !END-!START+1

!PERIOD=1
 SUBROUTINE LOCAL MEDIAN(SERIES DUMMY ,SCALAR !MED,
SCALAR !NOBS)
!NOBS1= !NOBS-1
FOR !I=1 TO !NOBS1
     !M=!I+1
```

```
    FOR !J=!M TO !NOBS
        IF DUMMY(!I) > DUMMY(!J) THEN !D=DUMMY(!I)
        DUMMY(!I)=DUMMY(!J)
        DUMMY(!J)=!D
        ELSE
        ENDIF
    NEXT !I
NEXT !J
!M=0
FOR !N=0 TO !NOBS
    !M=!M+2
    IF !M>=!NOBS THEN EXITLOOP
    ENDIF
NEXT !N
IF !M=!NOBS THEN !K= !NOBS/2
!MED=(DUMMY(!K)+DUMMY(!K+1))/2
ELSE
!K= !NOBS1/2
!MED=DUMMY(!K+1)
ENDIF
ENDSUB

 SMPL !START !END
TABLE(!NROWS,!NCOLS) SIMSTAT
SETCOLWIDTH(SIMSTAT,1,5)
SETCOLWIDTH(SIMSTAT,2,16)
SETCOLWIDTH(SIMSTAT,3,16)
SETCOLWIDTH(SIMSTAT,4,14)
SETCOLWIDTH(SIMSTAT,5,14)
FOR !J=6 TO !NCOLS
```

```
      SETCOLWIDTH(SIMSTAT,!J,16)
NEXT !J
FOR !J=1 TO !NCOLS
     SETCELL(SIMSTAT,1,!J,0,"C")
NEXT !J
SETLINE(SIMSTAT,2)
FOR !I=3 TO !NROWS
       %NUMBER=@STR(!I-2)+" "
      SETCELL(SIMSTAT,!I,1,%NUMBER,"R",4.0)
      SETCELL(SIMSTAT,!I,2,0,"L")
      SETCELL(SIMSTAT,!I,3,0,"L")
      SETCELL(SIMSTAT,!I,4,0,"R",14.0)
      SETCELL(SIMSTAT,!I,5,0,"R",14.0)
      FOR !J= 6 TO !NCOLS
          SETCELL(SIMSTAT,!I,!J,0,"R",16.5)
      NEXT !J
NEXT !I
SHOW SIMSTAT
GROUP TEMPGROUP
DELETE TEMPGROUP
SOLVE(M=!MAXIT,C=!PRECISION) %MODNAME
{%MODNAME}.MAKEGROUP(A,N) TEMPGROUP @ENDOG
 TABLE TEMPTAB
DELETE TEMPTAB
FREEZE(TEMPTAB) TEMPGROUP
 FOR   !I=1 TO !NVAR
     SIMSTAT(!I+2,3)=TEMPTAB(1,!I+1)+"_0"
     SIMSTAT(!I+2,2)=TEMPTAB(1,!I+1)
NEXT !I
```

```
%SIMTAG="_"+@STR(!PERIOD)
!IDLEPERIOD=0
FOR !N=!END TO !START+!LAGSTRUCTURE STEP -!PERIOD
            IF !N-!PERIOD<!START+!LAGSTRUCTURE-1 THEN
EXITLOOP
ELSE
            !IDLEPERIOD=!N-!PERIOD+1
            ENDIF
      SMPL !N-!PERIOD+1 !N
      SOLVE(M=!MAXIT,C=!PRECISION) %MODNAME
FOR !I=3 TO !NROWS
             %PERIODSIMULATED=SIMSTAT(!I,2)+%SIMTAG
             %SIMULATED=SIMSTAT(!I,3)
             SERIES  %PERIODSIMULATED
             SERIES  %SIMULATED
             GENR {%PERIODSIMULATED}={%SIMULATED}
NEXT !I
NEXT !N

!START=!IDLEPERIOD
!END= !END
SMPL !START !END
SIMSTAT(1,1)="No."
SIMSTAT(1,2)="Actual"
SIMSTAT(1,3)="Simulated"
SIMSTAT(1,4)="Observations"
SIMSTAT(1,5)="Non_zero obs"
SIMSTAT(1,6)="Mean actual"
SIMSTAT(1,7)="Mean simulated"
SIMSTAT(1,8)="Mean error"
```

```
SIMSTAT(1,9)="VAR(error)"
SIMSTAT(1,10)="SDV(error)"
SIMSTAT(1,11)="Median(error)"
SIMSTAT(1,12)="Max(error)"
SIMSTAT(1,13)="Min(error)"
SIMSTAT(1,14)="Skewness(error)"
SIMSTAT(1,15)="Kurtosis(error)"
SIMSTAT(1,16)="RMS Error"
SIMSTAT(1,17)="M percent error"
SIMSTAT(1,18)="RMS percent error"
SIMSTAT(1,19)="M absolute error"
SIMSTAT(1,20)="MA percent error"
SIMSTAT(1,21)="Corr(act,sim)"
SIMSTAT(1,22)="Cov(act,sim)"
SIMSTAT(1,23)="Theil U-Stat."
SIMSTAT(1,24)="Theil U-Bias"
SIMSTAT(1,25)="Theil U-Var"
SIMSTAT(1,26)="Theil U-Cov"
FOR !I=3 TO !NROWS
    SMPL !START !END
    %ACTUAL=SIMSTAT(!I,2)
    %SIMULATED=SIMSTAT(!I,2)+%SIMTAG
    SIMSTAT(!I,3)=%SIMULATED
    %ERROR="E_"+%ACTUAL
    %PERROR="P_"+%ACTUAL
    %APERROR="A_"+%ACTUAL
    SERIES %ACTUAL
    SERIES  %SIMULATED
    SERIES  %ERROR
    GENR {%ERROR}={%SIMULATED}-{%ACTUAL}
```

```
SIMSTAT(!I,4)=@OBS({%ACTUAL})
!AUX0=@OBS({%ACTUAL})
SMPL !START !END  IF ({%ACTUAL})<>0
SIMSTAT(!I,5)=@OBS({%ACTUAL})
SMPL !START !END  IF ({%ACTUAL})>0
!AUX1=@OBS({%ACTUAL})
IF !AUX1=!AUX0 THEN
GENR {%PERROR}={%ERROR} /{%ACTUAL}
GENR {%APERROR}=ABS({%ERROR} /{%ACTUAL})
ELSE
GENR {%PERROR}=NA
GENR {%APERROR}=NA
ENDIF
SMPL !START !END
GENR TEMP1=({%ERROR}-@MEAN({%ERROR}))^3
GENR TEMP2=({%ERROR}-@MEAN({%ERROR}))^4
SIMSTAT(!I,6)=@MEAN({%ACTUAL})
SIMSTAT(!I,7)=@MEAN({%SIMULATED})
SIMSTAT(!I,8)=@MEAN({%ERROR})

!VARIANCE=@VAR({%ERROR})*@OBS({%ERROR})/(@OBS({%E
RROR})-1)
SIMSTAT(!I,9)=!VARIANCE
SIMSTAT(!I,10)=SQR(!VARIANCE)
CALL MEDIAN({%ERROR}, !MED, !NOBS)
SIMSTAT(!I,11)=!MED
GENR {%ERROR}={%SIMULATED}-{%ACTUAL}
SIMSTAT(!I,12)=@MAX({%ERROR})
SIMSTAT(!I,13)=@MIN({%ERROR})
IF !VARIANCE<>0 THEN
```

```
SIMSTAT(!I,14)=
@MEAN(TEMP1)/(!VARIANCE^1.5)*@OBS({%ERROR})/(@OBS({%
ERROR})-1)

SIMSTAT(!I,15)=@MEAN(TEMP2)/(!VARIANCE^2)*@OBS({%ERRO
R})/(@OBS({%ERROR})-1)
ELSE
ENDIF
SIMSTAT(!I,16)=SQR(
@SUMSQ({%ERROR})/@OBS({%ERROR}))
SMPL !START !END IF ({%ACTUAL})<>0
IF !AUX1=!AUX0 THEN
SIMSTAT(!I,17)=@MEAN({%PERROR})

SIMSTAT(!I,18)=SQR(@SUMSQ({%PERROR})/@OBS({%PERROR}))
 ELSE
SIMSTAT(!I,17)="NA"
SIMSTAT(!I,18)="NA"
ENDIF
SMPL !START !END
SIMSTAT(!I,19)=@SUM(ABS({%ERROR}))/@OBS({%ERROR})
SMPL !START !END IF ({%ACTUAL})<>0
IF !AUX1=!AUX0 THEN

SIMSTAT(!I,20)=@SUM(ABS({%APERROR}))/@OBS({%ERROR})
ELSE
SIMSTAT(!I,20)="NA"
ENDIF
SMPL !START !END
SIMSTAT(!I,21)=@COR({%ACTUAL},{%SIMULATED})
```

```
	SIMSTAT(!I,22)=@COV({%ACTUAL},{%SIMULATED})
	SIMSTAT(!I,23)=SQR(
@SUMSQ({%ERROR})/@OBS({%ERROR}))  /
(SQR(@SUMSQ({%SIMULATED})/@OBS({%ERROR})) +
SQR(@SUMSQ({%ACTUAL})/@OBS({%ERROR})) )
	IF !VARIANCE<>0 THEN
	SIMSTAT(!I,24)= ( (@MEAN({%SIMULATED})-
@MEAN({%ACTUAL}))^2 ) /  (
@SUMSQ({%ERROR})/@OBS({%ERROR}) )
	SIMSTAT(!I,25)= ( (SQR(@VAR({%SIMULATED}))-
SQR(@VAR({%ACTUAL})))^2 ) /(
@SUMSQ({%ERROR})/@OBS({%ERROR}) )
	SIMSTAT(!I,26)= ( 2*(1-
@COR({%SIMULATED},{%ACTUAL}))*(
SQR(@VAR({%SIMULATED}))*SQR(@VAR({%ACTUAL})))  ) /  (
@SUMSQ({%ERROR})/@OBS({%ERROR}) )
	ELSE
	SIMSTAT(!I,24)=0
	SIMSTAT(!I,25)=0
	SIMSTAT(!I,26)=1
	ENDIF
'	DELETE {%SIMULATED}
	DELETE {%ERROR}
	DELETE {%PERROR}
	DELETE {%APERROR}
NEXT  !I
SETLINE (SIMSTAT,!NROWS+1)
SHOW SIMSTAT
DELETE TEMP1 TEMP2
DELETE TEMPTAB
```

A-4 Program SHOCK200.PRG

```
'This program evaluates the ex-post policy shock analysis of the
MODEL_200. By defining different individual shock policies this program
creates new simulated values and compares them with control solution
created by solution of the MODEL_200 with no policy shock.

'Initialization:
!START=1959
!END=2003
!SIMSTART=2000
!SIMEND=2003
%MODNAME="ver6_model_200"
%SYSNAME="SYS_200"
%SOLUTIONID="_1"
!NVAR=200
!NROWS=!NVAR+6
!MAXIT=50000
!PRECISION=1E-07
!NOBS= !SIMEND-!SIMSTART+1
!NCOLS=!NOBS+2

SUBROUTINE SHOCKTABLE(STRING %SOLUTION)
DELETE {%SOLUTION}
COPY TABFORM  {%SOLUTION}
{%SOLUTION}(1,1)=%SOLUTION+" SOLUTION TABLE"
{%SOLUTION}(2,1)="Dynamic solution of the model "+ %MODNAME+
" for the period of "+@STR(!SIMSTART)+ " to "+@STR(!SIMEND)
{%SOLUTION}(3,1)=%DESCRIPTION
```

```
SMPL !SIMSTART !SIMEND
SOLVE(M=!MAXIT,C=!PRECISION) %MODNAME

{%MODNAME}.MAKEGROUP TEMPGROUP @ENDOG
TABLE TEMPTAB
DELETE TEMPTAB
FREEZE(TEMPTAB) TEMPGROUP
DELETE TEMPGROUP
 FOR !I=1 TO !NVAR
    !SUMSOLUTION=0
    FOR !J=1 TO !NOBS
        {%SOLUTION}(!I+6,!J+2)=@VAL(TEMPTAB(!J+2,!I+1))
    !SUMSOLUTION=!SUMSOLUTION+{%SOLUTION}(!I+6,!J+2)
    NEXT !J
    {%SOLUTION}(!I+6,!NCOLS+1)=!SUMSOLUTION/!NOBS
NEXT !I
DELETE TEMPTAB
'SHOW %SOLUTION
ENDSUB

SUBROUTINE SHOCKSTAT(STRING %SHOCK,  STRING
%DIFFERENCE, STRING %PERCENTCHANGE)
DELETE {%DIFFERENCE}
DELETE {%PERCENTCHANGE}
COPY  TABFORM {%DIFFERENCE}
COPY  TABFORM {%PERCENTCHANGE}
{%DIFFERENCE}(1,1)=%DIFFERENCE+"  TABLE"
{%DIFFERENCE}(2,1)="Difference of shocked solution from control
solution"
{%DIFFERENCE}(3,1)=%DESCRIPTION
```

```
{%PERCENTCHANGE}(1,1)=%PERCENTCHANGE+"  TABLE"
{%PERCENTCHANGE}(2,1)="Percentage change of shocked solution
from control solution (%)"
{%PERCENTCHANGE}(3,1)=%DESCRIPTION
FOR  !I=7 TO !NROWS
    !SUMDIF=0
    !SUMPCH=0
    %FLAG="NO"
    FOR  !J=3 TO !NCOLS
        {%DIFFERENCE}(!I,!J)=@VAL({%SHOCK}(!I,!J)) -
@VAL(CONTROL(!I,!J))
        !SUMDIF=!SUMDIF+{%DIFFERENCE}(!I,!J)
        IF @VAL(CONTROL(!I,!J)) > 0 THEN
        {%PERCENTCHANGE}(!I,!J)=100*{%DIFFERENCE}(!I,!J)
/(@VAL(CONTROL(!I,!J)))
        !SUMPCH=!SUMPCH+{%PERCENTCHANGE}(!I,!J)
        ELSE
        %FLAG="YES"
        {%PERCENTCHANGE}(!I,!J)=NA
        ENDIF
    NEXT !J
    {%DIFFERENCE}(!I,!NCOLS+1)=!SUMDIF/!NOBS
     IF %FLAG="NO" THEN
    {%PERCENTCHANGE}(!I,!NCOLS+1)=!SUMPCH/!NOBS
    ELSE
    {%PERCENTCHANGE}(!I,!NCOLS+1)=NA
    ENDIF
NEXT !I
'SHOW %DIFFERENCE
SHOW %PERCENTCHANGE
```

```
SMPL !START !END
ENDSUB

TABLE TABFORM
DELETE TABFORM
TABLE(!NROWS,!NCOLS+1) TABFORM
SETCOLWIDTH(TABFORM,1,5)
SETCOLWIDTH(TABFORM,2,16)
FOR !J=3 TO !NCOLS+1
     SETCOLWIDTH(TABFORM,!J,12)
NEXT !J
SETLINE(TABFORM,4)
SETLINE(TABFORM,6)
FOR !J=3 TO !NCOLS+1
    SETCELL(TABFORM,5,!J,!J+!SIMSTART-3,"C",4.0)
NEXT !J
FOR !I=7 TO !NROWS
     %NUMBER=@STR(!I-6)+" "
    SETCELL(TABFORM,!I,1,%NUMBER,"R",4.0)
    SETCELL(TABFORM,!I,2,0,"L")
        FOR !J= 3 TO !NCOLS+1
              SETCELL(TABFORM,!I,!J,0,"R",12.3)
        NEXT !J
NEXT !I
TABFORM(5,1)="No."
TABFORM(5,2)="Variable Name"
TABFORM(5,!NCOLS+1)="Period Mean"
SETLINE (TABFORM,!NROWS+1)
{%MODNAME}.MAKEGROUP TEMPGROUP2 @ENDOG
```

```
TABLE TEMPTAB
DELETE TEMPTAB
FREEZE(TEMPTAB) TEMPGROUP2
DELETE TEMPGROUP2
FOR   !I=1 TO !NVAR
    TABFORM(!I+6,2)=TEMPTAB(1,!I+1)
NEXT !I
DELETE TEMPTAB

TABLE CONTROL
%DESCRIPTION="Pre-shock solution"
CALL  SHOCKTABLE("CONTROL")

TABLE SHK_IRWPOIL
SMPL !SIMSTART !SIMEND
GENR TEMP=IRWPOIL
GENR IRWPOIL=IRWPOIL+1
%DESCRIPTION="Policy shock: 1 dollar increase in foreign price of oil"
CALL  SHOCKTABLE("SHK_IRWPOIL")
SMPL !SIMSTART !SIMEND
GENR IRWPOIL=TEMP
TABLE DIF_IRWPOIL
TABLE PCH_IRWPOIL
CALL SHOCKSTAT("SHK_IRWPOIL",
"DIF_IRWPOIL","PCH_IRWPOIL")

TABLE SHK_IRYOILB
SMPL !SIMSTART !SIMEND
GENR TEMP=IRYOILB
GENR IRYOILB=IRYOILB*(1+0.10)
```

```
%DESCRIPTION="Policy shock:  %10 increase in production of oil"
CALL  SHOCKTABLE("SHK_IRYOILB")
SMPL !SIMSTART !SIMEND
GENR IRYOILB=TEMP
TABLE DIF_IRYOILB
TABLE PCH_IRYOILB
CALL SHOCKSTAT("SHK_IRYOILB",
"DIF_IRYOILB","PCH_IRYOILB")

TABLE SHK_IREO
SMPL !SIMSTART !SIMEND
GENR TEMP=IREO
GENR IREO=IREO*(1+0.10)
%DESCRIPTION="Policy shock:  %10 devaluation of official exchange
rate against dollar"
CALL  SHOCKTABLE("SHK_IREO")
SMPL !SIMSTART !SIMEND
GENR IREO=TEMP
TABLE DIF_IREO
TABLE PCH_IREO
CALL SHOCKSTAT("SHK_IREO", "DIF_IREO","PCH_IREO")

TABLE SHK_IREX
SMPL !SIMSTART !SIMEND
GENR TEMP=IREX
GENR IREX=IREX*(1+0.10)
%DESCRIPTION="Policy shock:  %10 devaluation of export exchange
rate against dollar"
CALL  SHOCKTABLE("SHK_IREX")
SMPL !SIMSTART !SIMEND
```

```
GENR IREX=TEMP
TABLE DIF_IREX
TABLE PCH_IREX
CALL SHOCKSTAT("SHK_IREX", "DIF_IREX","PCH_IREX")

TABLE SHK_IRKAD
SMPL !SIMSTART !SIMEND
GENR TEMP=IRKAD
GENR IRKAD=IRKAD+1000
%DESCRIPTION="Policy shock:  1000 million dollars increase in capital
account"
CALL  SHOCKTABLE("SHK_IRKAD")
SMPL !SIMSTART !SIMEND
GENR IRKAD=TEMP
TABLE DIF_IRKAD
TABLE PCH_IRKAD
CALL SHOCKSTAT("SHK_IRKAD", "DIF_IRKAD","PCH_IRKAD")

TABLE SHK_OECDP
SMPL !SIMSTART !SIMEND
GENR TEMP=OECDP
GENR OECDP=OECDP*(1+0.10)
%DESCRIPTION="Policy shock:  %10 increase in domestic prices of
industrial countries"
CALL  SHOCKTABLE("SHK_OECDP")
SMPL !SIMSTART !SIMEND
GENR OECDP=TEMP
TABLE DIF_OECDP
TABLE PCH_OECDP
CALL SHOCKSTAT("SHK_OECDP", "DIF_OECDP","PCH_OECDP")
```

```
TABLE SHK_IRCIFP
SMPL !SIMSTART !SIMEND
GENR TEMP=IRCIFP
GENR IRCIFP=IRCIFP*(1+0.10)
%DESCRIPTION="Policy shock:  %10 increase in CIF import prices"
CALL  SHOCKTABLE("SHK_IRCIFP")
SMPL !SIMSTART !SIMEND
GENR IRCIFP=TEMP
TABLE DIF_IRCIFP
TABLE PCH_IRCIFP
CALL SHOCKSTAT("SHK_IRCIFP", "DIF_IRCIFP","PCH_IRCIFP")

TABLE SHK_LIBOR
SMPL !SIMSTART !SIMEND
GENR TEMP=LIBOR
GENR LIBOR=LIBOR+1.00
%DESCRIPTION="Policy shock:  %1 increase in London interbank offer
rate"
CALL  SHOCKTABLE("SHK_LIBOR")
SMPL !SIMSTART !SIMEND
GENR LIBOR=TEMP
TABLE DIF_LIBOR
TABLE PCH_LIBOR
CALL SHOCKSTAT("SHK_LIBOR", "DIF_LIBOR","PCH_LIBOR")

TABLE SHK_IRFEOAV
SMPL !SIMSTART !SIMEND
GENR TEMP=IRFEOAV
GENR IRFEOAV=IRFEOAV+1000
```

```
%DESCRIPTION="Policy shock:  1000 billion Rials increase in foreign
exchange obligation account"
CALL  SHOCKTABLE("SHK_IRFEOAV")
SMPL !SIMSTART !SIMEND
GENR IRFEOAV=TEMP
TABLE DIF_IRFEOAV
TABLE PCH_IRFEOAV
CALL SHOCKSTAT("SHK_IRFEOAV",
"DIF_IRFEOAV","PCH_IRFEOAV")

TABLE SHK_IROLGV
SMPL !SIMSTART !SIMEND
GENR TEMP=IROLGV
GENR IROLGV=IROLGV+1000
%DESCRIPTION="Policy shock:  1000 billion Rials increase in
government budget government obligation loans"
CALL  SHOCKTABLE("SHK_IROLGV")
SMPL !SIMSTART !SIMEND
GENR IROLGV=TEMP
TABLE DIF_IROLGV
TABLE PCH_IROLGV
CALL SHOCKSTAT("SHK_IROLGV",
"DIF_IROLGV","PCH_IROLGV")

 TABLE SHK_IROLPV
SMPL !SIMSTART !SIMEND
GENR TEMP=IROLPV
GENR IROLPV=IROLPV+1000
%DESCRIPTION="Policy shock:  1000 billion Rials increase in
government budget private obligation loans"
```

```
CALL  SHOCKTABLE("SHK_IROLPV")
SMPL !SIMSTART !SIMEND
GENR IROLPV=TEMP
TABLE DIF_IROLPV
TABLE PCH_IROLPV
CALL SHOCKSTAT("SHK_IROLPV",
"DIF_IROLPV","PCH_IROLPV")

TABLE SHK_IRGRDSV
SMPL !SIMSTART !SIMEND
GENR TEMP=IRGRDSV
GENR IRGRDSV=IRGRDSV+1000
%DESCRIPTION="Policy shock:  1000 billion Rials increase in dollar sale
revenue"
CALL  SHOCKTABLE("SHK_IRGRDSV")
SMPL !SIMSTART !SIMEND
GENR IRGRDSV=TEMP
TABLE DIF_IRGRDSV
TABLE PCH_IRGRDSV
CALL SHOCKSTAT("SHK_IRGRDSV",
"DIF_IRGRDSV","PCH_IRGRDSV")

TABLE SHK_IRGECV
SMPL !SIMSTART !SIMEND
GENR TEMP=IRGECV
GENR IRGECV=IRGECV*(1+0.10)
%DESCRIPTION="Policy shock:  %10 increase in government current
expenditures"
CALL  SHOCKTABLE("SHK_IRGECV")
SMPL !SIMSTART !SIMEND
```

```
GENR IRGECV=TEMP
TABLE DIF_IRGECV
TABLE PCH_IRGECV
CALL SHOCKSTAT("SHK_IRGECV",
"DIF_IRGECV","PCH_IRGECV")

TABLE SHK_IRGEDV
SMPL !SIMSTART !SIMEND
GENR TEMP=IRGEDV
GENR IRGEDV=IRGEDV*(1+0.10)
%DESCRIPTION="Policy shock:  %10 increase in government
development expenditures"
CALL  SHOCKTABLE("SHK_IRGEDV")
SMPL !SIMSTART !SIMEND
GENR IRGEDV=TEMP
TABLE DIF_IRGEDV
TABLE PCH_IRGEDV
CALL SHOCKSTAT("SHK_IRGEDV",
"DIF_IRGEDV","PCH_IRGEDV")

'TABLE SHK_IRGESPV
'SMPL !SIMSTART !SIMEND
'GENR TEMP=IRGESPV
'GENR IRGESPV=IRGESPV+1000
'%DESCRIPTION="Policy shock:  1000 billion Rials increase in
government special payments"
'CALL  SHOCKTABLE("SHK_IRGESPV")
'SMPL !SIMSTART !SIMEND
'GENR IRGESPV=TEMP
'TABLE DIF_IRGESPV
```

```
'TABLE PCH_IRGESPV
'CALL SHOCKSTAT("SHK_IRGESPV",
"DIF_IRGESPV","PCH_IRGESPV")

TABLE SHK_IRPDOIL
SMPL !SIMSTART !SIMEND
GENR TEMP=IRPDOIL
GENR IRPDOIL=IRPDOIL*(1+0.10)
%DESCRIPTION="Policy shock:  %10 increase in domestic prices of oil
products"
CALL  SHOCKTABLE("SHK_IRPDOIL")
SMPL !SIMSTART !SIMEND
GENR IRPDOIL=TEMP
TABLE DIF_IRPDOIL
TABLE PCH_IRPDOIL
CALL SHOCKSTAT("SHK_IRPDOIL",
"DIF_IRPDOIL","PCH_IRPDOIL")

'TABLE SHK_IRGEFIV
'SMPL !SIMSTART !SIMEND
'GENR TEMP=IRGEFIV
'GENR IRGEFIV=IRGEFIV+100*IREO
'%DESCRIPTION="Policy shock:  100 million dollars increase in
government foreign investment"
'CALL  SHOCKTABLE("SHK_IRGEFIV")
'SMPL !SIMSTART !SIMEND
'GENR IRGEFIV=TEMP
'TABLE DIF_IRGEFIV
'TABLE PCH_IRGEFIV
```

```
'CALL SHOCKSTAT("SHK_IRGEFIV",
"DIF_IRGEFIV","PCH_IRGEFIV")

TABLE SHK_IRIRL
SMPL !SIMSTART !SIMEND
GENR TEMP=IRIRL
GENR IRIRL=IRIRL +1
%DESCRIPTION="Policy shock:  %1 increase in banking loans interest
rate"
CALL  SHOCKTABLE("SHK_IRIRL")
SMPL !SIMSTART !SIMEND
GENR IRIRL=TEMP
TABLE DIF_IRIRL
TABLE PCH_IRIRL
CALL SHOCKSTAT("SHK_IRIRL", "DIF_IRIRL","PCH_IRIRL")

TABLE SHK_IRIRS
SMPL !SIMSTART !SIMEND
GENR TEMP=IRIRS
GENR IRIRS=IRIRS +1
%DESCRIPTION="Policy shock:  %1 increase in saving deposits interest
rate"
CALL  SHOCKTABLE("SHK_IRIRS")
SMPL !SIMSTART !SIMEND
GENR IRIRS=TEMP
TABLE DIF_IRIRS
TABLE PCH_IRIRS
CALL SHOCKSTAT("SHK_IRIRS", "DIF_IRIRS","PCH_IRIRS")

TABLE SHK_IRMACHIMV
```

```
SMPL !SIMSTART !SIMEND
GENR TEMP=IRMACHIMV
GENR IRMACHIMV=IRMACHIMV+0.01
%DESCRIPTION="Policy shock:  %1 increase in import share of
machinary and equipments"
CALL  SHOCKTABLE("SHK_IRMACHIMV")
SMPL !SIMSTART !SIMEND
GENR IRMACHIMV=TEMP
TABLE DIF_IRMACHIMV
TABLE PCH_IRMACHIMV
CALL SHOCKSTAT("SHK_IRMACHIMV",
"DIF_IRMACHIMV","PCH_IRMACHIMV")

FOR   !I=1 TO !NVAR
    %CLEAN=@MID(TABFORM(!I+6,2),1,16)
    DELETE %CLEAN
NEXT !I
DELETE TEMP TABFORM
```

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Many endeavors have been made to build macro-econometric models for Iran, but the problem of macro-modelling is not just putting equations beside together. The closure of the model and the links between the variables throughout the model and its simultaneity is the most important part of simultaneous system of equations. Structural versus time series models are based on different approaches of Cambridge and Chicago schools to formulation of economic phenomena. The former is based on logical foundations of economic theory and is best for policy analysis, though the latter focuses on empiricism and predicts the future better if economic structure remains unchanged. The version 6.1 of the Macro Econometric Model of Iran which is a structural model is still at the end of all structural models of Iran and has been using for many policy analyses for domestic economy and international scene policy simulations as LINK project of the United Nations. Macro Econometric Model of Iran is a fully analyzed built structural model and can be used as a base for development of macro or sectoral structural econometric model for Iran and also as a framework to be used for adaptation in other countries.

Macro Econometric Model of Iran

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Professor Bijan Bidabad is a multidisciplinary experienced scientist. He received B.A. in Political Science, M.S. and Ph.D. in Economics from Iran and Switzerland and has written more than 400 papers and books. Largest Macroeconometric Model of Iran, Rastin Banking and proposition of different international law declarations are of his recent works.

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