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ECONOMIC POLICY ANALYSIS IN A MACROECONOMETRIC MODEL FOR IRAN

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ABSTRACT

In this paper an attempt is made to incorporate the major characteristics of the Iranian economy into a macroeconomic model. We have maintained a specification of the model as general as possible and used widely accepted developing country specifications. A unified data set provided by the IMF's IFS is used and we have relied on an appropriate econometric technique for the estimation of the model's parameters. For the purpose of dynamic simulation of the model we have utilised a computer program of ordinary substitution method.

The Iranian experience is of considerable importance not least because of the role this country plays in the Middle East and also its position as a founder member of the Economic Co-operation Organisation (ECO) which consists of Iran, Turkey, Pakistan, Afghanistan and six newly independent states of the former Soviet Union.

In this paper we aim:

(i) To generate a set of macroeconomic parameters for Iran that are recognised to be important for policy analysis and policy recommendation.

(ii) To establish whether the economy has been structurally stable throughout the sample period of 1959-93.

(iii) To use the estimated model for partial equilibrium and

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impact multiplier analysis of the economy in the short- run.

As a result, this study probides considerable knowledge about the structure of the Iranian economy in the period 1959-93 and about the impact of macroeconomic policy within the economy. Some of this knowledge might usefully be generalised to other developing countries, particularly to the oil exporting countries in which oil revenues constitute a substantial part of total government revenue.

1. The Model

In this paper a macroeconomic model is developed to explore, within a developing country context, the channels through which economic policy instruments affect domestic aggrgate demand and supply and to identify the parameters that govern their effectiveness. The model is a flexible- price dynamic version of the traditional Mundell- Fleming model, modified to take account of the characteristics of developing countries. A single good is produced domestically that can be sold at home and abroad and there is an imported good. The specification of private consumption is conventional, assuming as it does that its determinants are: the real rate of interest, disposable income and lagged aggregate consumption. Total investment is sub- divided to the private investment and government development expenditure, the latter treated as an exogenous variable. Private investment is a function of aggregate income, the real aggregate capital stock and real the rate of interest. In order to test the effects of government development expenditure and domestic bank credit on private capital formation, these two variables are also included in the private investments fuction, All agents in the economy are assumed to be price- takers for imports in the international markets while exerting some monopoly power over the price of exports in the world market. However, because Iran is a developing country, the availability of foreign exchange (measured by the lagged reserves to imports ratio) is included in the import demand function as an explanatory variable to capture the effects of exchange controls on imports. The aggregate production functions is a neo-classical production function and assumes that the aggregate output to be a function of the capital stock, labour force and the current period investment.

On the financial side, some of the main features of developing countries are integrated into the model. These include the absence of a market for domestic securities. The presence of capital controls and the official determination of interest rates on bank assets and liabilities. The market determined interest rate is formulated as a weighted average of the international (uncovered parity) interest rate and a domestic shadow interest rate. This shadow interest rate is the which would clear the domestic money market in the absence of capital mobility. Having constructed the market determined interest rate we can estimate an index of the effective degree of capital mobility in the economic system; and the interest rate sensitivity of consumption, investment and the demand for money.

From the specification of the simulataneous equations model a set of structural equations consistent with the equations and identities can be found. Table (1) summarises the structure of the model. definition of the exogenous and the endogenous variables of the model is given in tables(2) and (3) respectively.

Table 1 Specification of the model

(1) ... $Ad_t = C_t + Pi_t + Gi_t + X_t - (e_t . P_t^* / P_t) Z_t$

(2) ... $Da_t = + Pi_t + C_t + G_t$

(3) ... $\log C_t = \alpha_0 + \alpha_1 r_t + \alpha_2 \log C_{t-1} + \alpha_3 \log Yd_t + \alpha_4 \log Yd_{t-1}$

(4) ... $Yd_t = Y_t + (i_t^* . e_t . Fp_{t-1}) / P_t - (i_t . Dcp_{t-1}) / P_t - Dtax_t$

(5) ... $\log Pi_t = \kappa_0 + \kappa_1 r_t + \kappa_2 \log Y_t + \kappa_3 \log K_{t-1} + \kappa_4 \log Gi_t$

$+ \kappa_5 \log (Dcp_t / P_t)$

(6) ... $Ti_t = Gi_t + Pi_t$

(7) ... $\log X_t = \tau_0 + \tau_1 \log (e_t . P_t^* / P_t) + \tau_2 \log Y_t^* + \tau_3 \log X_{t-1}$

(8) ... $\log (P_t^* . e_t . / P_t) Z_t = \delta_0 + \delta_1 \log (e_t . P_t^* / P_t) + \delta_2 \log Y_t$

$+ \delta_3 \log (Fr_{t-1} / P_{t-1}^* . Z_{t-1}) + \delta_4 \log (P_{t-1}^* . e_{t-1} / P_{t-1t}) Z_{t-1}$

(9) ... $\log Y_t = A' + \theta_0' \log K_{t-1}' + \theta_1 \log L_t + \theta_2' \log Ti_t$

(10) ... $G_t = Gc_t + Gi_t$

(11.1) ... $T_t = (Dtax_t + Indtax_t) + Oilr_t$

(11.2) ... $Dtax_t = dtaxr . (Y_t)$

(11.3) ... $Indtax_t = indtaxr . (Y_t)$

Table 1 Continued

(12) ... $Nft_t = (Ca_t + P_t . Da_t) - P_t . Y_t$

(13) ... $Ca_t = P_t . X_t - e_t . P_t^* . Z_t + e_t . Fae_t$

(14) ... $Fae_t = i_t^* . (Fr_{t-1} + Fp_{t-1} + Fg_{t-1})$

(15) ... $Bop_t = (1/e_t) Ca_t - (\Delta Fp_t + \Delta Fg_t)$

(16) ... $Fr_t = Fr_{t-1} + Bop_t$

(17.1) ... $Fp_t = Fp_{t-1} + \Delta Fp_t$

(17.2) ... $\Delta Fp_t = (1/e_t)[P_t . (Yd_t - C_t - Pi_t) - (\Delta M_t - \Delta Dcp_t)]$

(18) ... $Fg_t = Fg_{t-1} + \Delta Fg_t$

(19) ... $M_t = M_{t-1} + e_t . Bop_t + \Delta Dcg_t + \Delta Dcp_t$

(20) ... $Dc_t = Dc_{t-1} + \Delta Dcg_t + \Delta Dcp_t$

(21) ... $Dcg_t = Dcg_{t-1} + \Delta Dcg_t$

(22) ... $Dcp_t = Dcp_{t-1} + \Delta Dcp_t$

(23) ... $\log\left(\frac{M_t}{P_t}\right) = \lambda \beta_0 + \lambda \beta_1 i_t + \lambda \beta_2 \log Y_t + (1-\lambda) \log\left(\frac{M_{t-1}}{P_{t-1}}\right)$

(24) ... $\log\left[\frac{M_t}{P_t}\right]^{ld} = \beta_0 + \beta_1 i_t + \beta_2 \log Y_t$

(25.1) ... $\Delta \log\left[\frac{M_t}{P_t}\right] = \lambda\left[\log\left[\frac{M_t}{P_t}\right]^{ld} - \log\left[\frac{M_{t-1}}{P_{t-1}}\right]\right]$

(25.2) ... $Emb_t = \log\left[\frac{M_t}{P_t}\right] - \log\left[\frac{M_t}{P_t}\right]^{ld}$

(26) ... $\tilde{M}_t = M_t + e_t . \Delta Fp_t$

$$(27) \ldots r_t = i_t - \left(\frac{EP_{t-1} - P_t}{P_t}\right)$$

$$(28) \ldots \tilde{i}_t = -\frac{\beta_0}{\beta_1} - \frac{\beta_2}{\beta_1} \log Y_t - \frac{(1-\lambda)}{\lambda\beta_1} \log\left(\frac{\tilde{M}_{t-1}}{P_{t-1}}\right) + \frac{1}{\lambda\beta_1} \log\left(\frac{\tilde{M}_t}{P_t}\right)$$

$$(29) \ldots i_t = \phi\left(i_t^* + \frac{Ee_{t+1} + e_t}{e_t}\right) + (1-\phi)\,\tilde{i}_t$$

$$(30) \ldots EP_{t+1} = P_{t+1} + u_{t+1}$$

Table 2 Exogenous variables of the model

Gc = Real government consumption expenditure
Gi= Real government investment expenditure
Dtaxr = Direct taxation rate
Indtaxr = Indirect taxation rate
Oilr = real oil revenues
ΔFg = Net change to foreign assets held by public sector (nominal)
ΔDcg = Net change in domestic credit to public sector (nominal)
ΔDcp = Net change in domestic credit to private sector (nominal)
e = Nominal, official exchange rate
Y^*= Real world income (approximated by OECD income in 1985 price)
P^*= World consumer price index (WCPI)
i^*= International interest rate (3 months London market)
i_b= formal interest rate charged by the domestic banking system
L = Labour force

Table 3 Definition of the endogenous variables of the model

Ad = Real aggregate demand
Da = Real domestic absorption
C = Real private consumption
Yd = Real disposable income
Pi = Real private investment
Ti = Real total investment
X = Real export
Z = Real import
Y = Real aggregate output
G = Real total government expenditure
T = Real total government revenues
Dtax = Real direct taxation

Nft = Nominal net factor income from abroad
Ca = Nominal current account of the balance of payments
Fae = Nominal foreign assets earnings (in foreign exhchange terms)
Bop = Nominal balance of payment (in foreign echchange terms)
Fr = Nominal foreign exchange reserves (in foreign exchange terms, US dollars)
Fp = Nominal foreign assets held by private sector (in foreign currency terms)
Fg= Nominal foreign assets held by public sector (in foreign currency terms)
M = Nominal money supply (broad definition of money i.e. M_2)
Dc = Nominal domestic credit
Dcg = Nominal domestic credit to public sector
Dcp = Nominal domestic credit to private sector
(M/P) = Money market equilibrium
$(\frac{M}{P})^{ld}$ = Real, long-run demand for money
Emb = Excess money balance
$\tilde{M}$ = Nominal, shadow money balance
r = Real rate of interest
$\tilde{i}$ = Nominal "shadow" interest rate
i = Nominal (market determined) interest rate
EP_{t+1}= Expected price of the next period in the current period

From the structural equations given in table (1) we only have to estimate the behavioual equations of the model which contain unknown parameters. The behavioural equations to be estimated are the consumption function (eq.3), the private investment equation (eq.5), export (foreign) demand (eq.7), import demand (eq.8), the aggregate production function (eq.9), the demand for money (eq.23) and the market determined interest rate (eq.29).

2. Estimation Methodology

In order to estimate the behavioural equations mentioned above we have to address two issues: (i); unobserved variables and (ii); expectations. Also we note that OLS would not yield unbiased estimators because of the stochastic regressors.

2.1. Unobserved variables

The absence of data on the market determined interest rates (i_t) and certainly the real rate of interest (r_t) is typical of most developing countries.

The relevantmarket- determined interest rate is that for loans in informal or curb markets. Time series data on such interest rates are not available. In Iran, as in most developing countries, the official interest rates reported by the central bank (Bank Markazi Iran) refer to the discount rate of the central bank (before 1979) and to the bank rate of return on time deposits and investment accounts after 1979. These rates do not capture the marginal cost of funds and cannot be taken as the market determined interest rate. Thus the consumption function (eq.3), the private investment function (eq.5) and the money demand function (eq.23), cannot be estimated as they stand. To address this issue we eliminate (i_t) and (r_t) from these equations by appropriate substitutions. Eliminating r and i from the above mentioned equations we therefore have the following set of simultaneous equations to estimate:

Table 4 Estimating form of the behavioural equations
(revised) consumption function

$$(3')\ldots \log C_t = \alpha_{01} + \alpha_{11}\left(i_t^* + \frac{Ee_{t+1} + e_t}{e_t}\right) + \alpha_{12}\log Y_t + \alpha_{13}\log\frac{\tilde{M}_{t-1}}{P_{t-1}}$$

$$+ \alpha_{14}\log\frac{\tilde{M}_t}{P_t} - \alpha_1\left(\frac{EP_{t-1} - P_t}{P_t}\right) + \alpha_2\log C_{t-1} + \alpha_3\log Yd_t + \alpha_4\log Yd_{t-1}$$

$$\alpha_{01} = \alpha_0 + \alpha_1(\phi - 1)\frac{\beta_0}{\beta_1}\ ;\ \alpha_{11} = \alpha_1\phi;\ \alpha_{12} = \alpha_1(\phi - 1)\frac{\beta_2}{\beta_1}$$

$$;\ \alpha_{13} = \alpha_1(1 - \lambda)\frac{(\phi - 1)}{\beta_1\lambda}\ ;\ \alpha_{14} = \frac{\alpha_1(1 - \phi)}{\beta_1\lambda}$$

(revised) private investment

$$(5')\ldots \log Pi_t = \kappa_{01} + \kappa_{11}\left(i_t^* + \frac{Ee_{t-1} - e_t}{e_t}\right) + \kappa_{12}\log Y_t + \kappa_{13}\log\frac{\tilde{M}_{t-1}}{P_{t-1}}$$

$$+ \kappa_{14}\log\frac{\tilde{M}_t}{P_t} - \kappa_1\left(\frac{Ep_{t-1} - P_t}{P_t}\right) + \kappa_3\log K_{t-1} + \kappa_4\log Gi_t + \kappa_5\log\frac{Dcp_t}{P_t}$$

$$\kappa_{01} = \kappa_0 + \kappa_1(\phi - 1)\frac{\beta_0}{\beta_1}\ ;\ \kappa_{11} = \kappa_1\phi;\ \kappa_{12} = \kappa_1(\phi - 1)\frac{\beta_2}{\beta_1} + \kappa_2$$

$$;\ \kappa_{13} = \kappa_1\frac{(1 - \lambda)(1 - \phi)}{\beta_1\lambda}\ ;\ \kappa_{14} = \kappa_1\frac{(1 - \phi)}{\beta_1\lambda}$$

Export (foreign) demand

$$(7)\ldots \log X_t = \tau_0 + \tau_1 \log\left(\frac{e_t \cdot P_t^*}{P_t}\right) + \tau_2 \log Y_t^* + \tau_3 \log X_{t-1}$$

Import demand

$$(8)\ldots \left(\frac{e_t \cdot P_t^*}{P_t}\right) Z_t = \delta_0 + \delta_1 \log\left(\frac{e_t \cdot P_t^*}{P_t}\right) + \delta_2 \log Y_t + \delta_3 \log\left(\frac{Fr_{t-1}}{P_{t-1}^* \cdot Z_{t-1}}\right)$$
$$+ \delta_4 \log\left(\frac{e_{t-1} \cdot P_{t-1}^*}{P_{t-1}}\right) Z_{1-1}$$

(Modified) aggregate production function

$$(9)\ldots \log Y_t = A' + \theta_0' \log K_{t-1}' + \theta_1 \log L_t + \theta_2' \log Ti_t$$

$$\log K_{t-1}' = \log 2 + \frac{1}{2} \log \sum_{i=1}^{t-(1-1)} (1-\rho)^{i-1} . T_{it-(i-1)} + \frac{t-1}{2}(1-\rho)$$
$$+ \frac{1}{2} \log K_0 \,;\theta_0' = \frac{\theta_0}{2} \,;\, \theta_2' = \frac{\theta_0 \theta_2}{2}$$

(revised) demand for money function

$$(23')\ldots \log\left(\frac{M_t}{P_t}\right) = \Omega_0 + \Omega_1 \left(i_t^* + \frac{Ee_{t+1} - e_t}{e_t}\right) + \Omega_2 \log Y_t + \Omega_3 \log \frac{\tilde{M}_{t-1}}{P_{t-1}}$$
$$+ (1-\lambda) \log \frac{M_{t-1}}{P_{t-1}} + (1-\phi) \log \frac{\tilde{M}_t}{P_t}$$

$$\Omega_0 = \lambda \phi \beta_0 \,;\, \Omega_1 = \lambda \phi \beta_1 \,;\, \Omega_2 = \lambda \phi \beta_2 \,;\, \Omega_3 = (1-\lambda)(\phi - 1)$$

2.2. Expectations

The second issue to be addressed involves the assumed mechanism for expectation formation to be employed in the model. The assumption of rationality implies that forward looking agents form their expectations of prices on the basis of all available information, including the structure of the model.

This implies that prediction errors should be non- systematic.

$$(31) \ldots P_{t+1} = EP_{t+1} + \mu_{t+1}$$

where μ_{t+1} are white noise random terms. To estimate the model some proxies are needed for EP_{t+1} A candidate proxy is the actual value of P_{t+1}. There are two possible methods of estimation. One procedure involves substitution of the realised (observed) values for the expected values and using some appropriate instrument variables. The instruments for the realised variables are taken from the predicted values obtained from the regression of the realised variable on a matrix of variables selected from the information set (Ω_t); (see MacCallum, (1976)). This so called substitution method thus requires replacement of rationally expected variables by forecasts. The other procedure is the Errors in Variables Method (EVM) (see Wichens, 1982). This method is based on drawingg an explicit expression for the rationally expected variables from the model. These are substituted for the expected variables and the model is estimated using any implied parameter constraints. Thus in this method, the realised variables are treated as additional endogenous variables of the model and all equations are estimated together.

3. Estimation results

It should be noticed that in order to obtain a set of consistent estimates we have used the 2SLS method to estimate the structural parameters of the model. Most of these parameters are obtained directly. However, values of parameters related to the unobservble interest rate and the real rate of interest; and also value of the parameters ϕ and λ (which measure the degree of capital mobility and excess money adjustment respectively) had to be extracted from the estimated values for parameters of the revised equations for consumption, private investment and the demand for money. Data used in this study are taken from issues of the International Monetary Fund's International Financial Statistics (ISF) and the World Economic Outlook, and also issues of the Iranian central bank's (Bank Markazi Iran) Annual Reports Data are annual covering the period 1959-1992. All stock data are measured at the end of the period and the price data are period averages. To summarise the estimation results of the simultaneous equation model we have given these results in table (5).

Table 5 2SLS estimate of structural parameters

Consumption function

$$(32) \ldots \log C_t = .13 - .023\, r_t + .39 \log C_{t-1} + .58 \log Yd_t$$

(T-ratios) (.90) (-2.0) (2.7) (4.4)

$\overline{R}^2 = .991$; DW $= 2.2$; $\chi^2_{sc}(1) = .41$; $\chi^2_{ff}(1) = .02$; $\chi^2_{n}(2) = .79$; $\chi^2_{h}(1) = 2.5$

Private investment

$$(33) \ldots \log Pi_t = -10.86 - .035\, r_t + .79 \log Y_t + 1.45 \log K_{t-1} + .41 \log Gi_t - .95 \log(Dcp_{t-1}/P_{t-1})$$

(T-ratios) (-3.7) (-1.24) (2.4) (2.4) (3.0) (-2.4)

$\overline{R}^2 = .91$; DW $= 1.89$; $c^2_{sc}(1) = .88$; $c^2_{ff}(1) = .029$; $c^2_{n}(2) = .66$; $c^2_{h}(1) = .002$

Export demand

$$(34) \ldots \log X_t = -9.2 + .94 \log\left(\frac{e_t . P^*_t}{P_t}\right) + .90 \log Y^*_t + .64 \log X_{t-1} - .60\, Dum$$

(T-ratios) (-2.3) (2.2) (2.7) (5.9) (-4.5)

$\overline{R}^2 = .86$; DW $= 1.84$; $\chi^2_{sc}(1) = .19$; $\chi^2_{ff}(1) = .62$; $\chi^2_{n}(2) = 5.4$; $\chi^2_{h}(1) = .43$

Import demand

$$(35) \ldots \log \left[\frac{e_t . P^*_t}{P_t}\right] Z_t = -.013 \log \left[\frac{e_t . P^*_t}{P_t}\right] - 1.6 \log Y_{t-1} + 2. \log Y_t$$

(T-ratio) (-.119) (-4.1) (4.9)

$$+ .11 \log \left[\frac{e_t . P^*_t}{P^*_{t-1} . Z_{t-1}}\right] + .58 \log \left[\frac{e_{t-1} . P^*_{t-1}}{P_{t-1}}\right] Z_{t-1} - .35\, Dum$$

(2.7) (5.6) (-4.0)

$\overline{R}^2 = .93$; DW $= 1.97$; $\chi^2_{sc}(1) = .007$; $\chi^2_{ff}(1) = 1.19$; $\chi^2_{n}(2) = 1.6$; $\chi^2_{h}(1) = .008$

Aggregate Production function

$$(36) \ldots \log(Y_t) = \underset{(11.0)}{2.4} + \underset{(2.7)}{..14} K'_{t-1} + \underset{(5.9)}{.70} \log L_t + \underset{(15.2)}{.50} \log Ti_t$$

(T-ratio)

$$\bar{R}^2 = .98 \; ; \quad DW = 1.60 \; ; \quad \chi^2_{sc}(1) = .46 \; ; \quad \chi^2_{ff}(1) = 1.9$$
$$; \quad \chi^2_{n}(2) = 2.2 \; ; \quad \chi^2_{h}(1) = .3$$

Demand for money

$$(37) \ldots \log\left[\frac{M_{t1}}{P_t}\right] = \underset{(-4.1)}{-1.3} - \underset{(1.2)}{.005} i_t + \underset{(4.3)}{.24} \log Y_t - \underset{(-3.9)}{.83}\left[\frac{P_t - P_{t-1}}{P_{t-1}}\right] + \underset{(30.5)}{.92} \log\left[\frac{M_{t-1}}{P_{t-1}}\right]$$

(T-ratio)

$$\bar{R}^2 = .997 \; ; \quad DW = 1.70 \; ; \quad \chi^2_{sc}(1) = .66 \; ; \quad \chi^2_{ff}(1) = .22$$
$$; \quad \chi^2_{n}(2) = 2.1 \; ; \quad \chi^2_{h}(1) = 1.3$$

The estimated model turns out to be a reasonable proxy of the Iranian economy in period 1959-91. All estimated functions explain much of the variation in actual variables. Goodness of fit for all the estimated equations is above 91 percent except for the exports (foreign) demand function which is about 86 percent. Overall, the estimated model represents a standard macroeconomic model adapted to accommodate a developing economics' main characteristics.

Aggregate consumption expenditure in the Iranian economy in the sample period of 1959-91 has been mainly responsive to the real disposable income of the private sector and to some extent to the previous period consumption expenditure. No evidence could be found of a significant effect of the real rate of interest on consumption expenditure. The short-run and long-run income elasticity of consumption turned out to be 58 percent and 95 percent respectively, close to some other estimates of this economy (see Kiani 1992). Our results therefore reject the Hall (1978) specification of the permanent income hypothesis in the Iranian economy in this period. The most influential explanatory variables on private investment were real aggregate income and the capital stock of the economy. Our estimates also indicate that public sector investment exerts a significant and positive effect on private capital formation. No significant relationship was found between the interest rate and private investment, although the sign on the interest rate coefficient in the investment function was negative in accordance with economic theory. Export (foreign) demand was found to be responsive to price changes but import demand appeared quite price inelastic. Considering the nature of the imports and the immense necessity of the imported capital and intermediary goods in the economic development of the country, a price inelastic demand for imports reflects a familiar characteristic of the Iranian economy. The income elasticity of the demand for imports on the other hand is quite large (2.07) suggesting that in Iran, as in most developing countries the major difficulties of the economy lie on the supply side-demand appears quite strong for home and imported goods and is largely dependent on aggregate income. Also our estimates show that the coefficient on the lagged reserve- import ratio is significant and positive reflecting the foreign exchange constraint in the economy. The Marshall-Lerner condition is satisfied in our model in the long-run but not on impact. The per capita stock of capital affects current output significantly and positively with a short-run elasticity of ablut .20 and of close to .62 in the long-run. The capital stock and the labour force both appeared to exert significant and positive influences on aggregate supply, reflecting the technological change embedded in new investments. The estimated production function exhibited constant returns to scale. Except for that on the interest rate, the coefficients in the estimated demand for money function are all significant and of the expected sign. The estimated income elasticities are .23 and 2.8 in the short-run and long-run respectively. The coefficient on the inflation rate in the demand for money function was found to be negative and highly significant. One interpretation of this is that the inflation rate should be regarded as the opportunity cost of holding money in this economy over the smple time period. Our modelling approach allowed us to estimate the effective degree of capital mobility (indexed by the parameter ϕ). The estimate of ϕ in our study of the Iranian economy turns out to be about .62 indicating, a relatively high degree of capital mobility in this economy. This finding implies that economic agents find ways (and certainly in the long-run) to get around official barriers adopted to curb private capital transfers.

These findings have a number of implications for policy. As Haque et al (1993) argue "...the existence of capitalmobility, for example, aggravates the destabilising potential of exchange rate overvaluation, and thus emphasises the importance of avoiding exchange rate misalignment. At the same time, it underlines the futility of financial repression as a means of keeping domestic interest rates low to stimulate investment". (Haque et al 1993 p. 353). However, while correction of an existing exchange rate misalignment will move the economy in the right direction, we should note that this will only happen slowly due to the satisfaction of the Marshall-Learner condition in the long-run and the sustained balance of payments deficit. Therefore complementary demand management policies are needed to correct external balances in the short-run.

Finally, it will be noted that although estimation of the parameters of model are useful in indicating how it fits diverse circumstances, this is only an intermediate step in assessing the value of the model for policy-making purpose. If the multipliers linking endogenous variables with the policy instruments are very sensitive to changes in the parameters, the robustness of the model and the degree of precision in forecasting with the model will be low. To assess the usefulness of the model estimated above we could investigate two types of issues: (i), whether the key parameters of the structural model are stable, and (ii), how sensitive the policy implications are to changes in the parameters. These issues are addressed in the next sections of this paper.

4. Structural Stability

We now use Chow's first and second tests to establish the structural stability of the main behavioural equations of the model estimated by 2SLS method. The most common use for structural stability tests is as a general test of specification, because rejection of coefficient constancy constitutes evidence against the specification of the estimated model. Alternatively, it may be intended to use the model for forecasting, and the confidence which with the forecast are regarded will be related to how stable the relation is over the sample data available (Pesaran et al (1985)). Thus, testing for the structural stability of the macroeconomic model developed and estimated in this study serves the following purposes: first, it provides information on whether or not the model is correctly specified. This is important because our analysis of the economy's characteristics is based on the estimated coefficients of the behavioural equations. Second, given the structural stability of the model, it is possible to derive the IS-LM curves of the model which can then be used for the short-run impact multiplier and policy analysis of the economic system.

Chow's first test, known as the analysis of variance test in the literature, is given as:

$$(38) \ldots F_{a.v.} = \frac{\left[\hat{e}'\hat{e} - (\hat{e}_1' . \hat{e}_1 + \hat{e}_2 . \hat{e}_2)\right]/(k+1)}{(\hat{e}_1' . \hat{e}_1 + \hat{e}_2 . \hat{e}_2)/(n_1 + n_2 - 2k - 2)}$$

which is distributed as $F(k+1\ ,\ n_1 + n_2 - 2 - 2k)$. In (5.1) $\hat{e}'\hat{e}$ is the residual sum of squares for the whole period while $\hat{e}_1' . \hat{e}_1$ is residual sum of squares for the first sub-period and $\hat{e}_2 . \hat{e}_2$ for the second period. k is the number of the explanatory variables of the regression and $n_i \ \ i = 1, 2$ denotes number of observations for the sub-periods. The number $n - 2k - 2$ therefore, refers to the degree of freedom (d.f.). Chow's second test, also known as the predictive failure test or the predictive test for stability is given as:

$$(39) \ldots F_{p.f.} = \frac{\left[\hat{e}'.\hat{e} - \hat{e}_1'.\hat{e}_1\right]/n_2}{\hat{e}_1'.\hat{e}_1/n_1 - k - 1)}$$

which has an F-distribution with d.f. n_2 and $n_1 - k - 1$, where k is the number of the explanatory variables. This test was intended for testing the hypothesis of coefficient equality when there were insufficient degrees of freedom in the second period. However, it should be noted that $F_{p.f.}$ in equation (39) is not just a test of coefficient equality for these cases and can be applied to test the structural stability of the model what ever the degree of freedom is in the second period.

We have summarised the tests results in table (6). We have split the sample period into two sub-periods 1959-1979 and 1980-1991 for the reason that there have been dramatic changes in socio-economic environment in Iran following the 1979 revolution in the country. These results clearly support the hypotheses that the parameters of the main behavioural equations of the model have been stable in the time period (1959-91). On the basis of Chow's both first and second test structural stability of the consumption function, private investment and the real demand for money in the sample period 1959-91 cannot be rejected at the 5 percent level of significance. With respect to aggregate production function the results are mixed. For the production function in non-per labour form, analysis of variance test fails to satisfy at 5 percent level, while the predication test comes up in favour of parameter constancy of this regression. Regarding the relative power of the two tests this may lead to the interpretation that the aggregate production function in non pre labour form is either misspecified or is the subject of a structural shift. However, as the results presented in table (6) indicate both Chow's tests for aggregate production function in per-labour form are satisfied at the 5 percent level of significance. In our empirical study we have found empirical evidence supportive of constant return to scale for the aggregate production function in the model.

Table 6 summary of the results of Application of the Chow tests

	First test (analysis of variance test)			Second test (prediction test)		
	(d.f.)	critical value of F-test	value of F in the model	(d.f.)	critical value of F test	value of F in the model
Consumption function						
log C	(3,26)	2.38	1.04	(12,17)	2.95	1.05
Private investment						
log Pi	(5,22)	2.66	0.39	(12,15)	2.48	0.53
Aggregate supply						
log Y	(4,24)	2.78	3.6	(12,16)	2.42	1.67
Aggregate supply in per labour form						
log (Y/L)	(5,21)	2.68	0.655	(13,13)	2.58	1.28
Money demand						
log (M/P)	(5,21)	2.68	1.33	(11,11)	2.50	0.69

The prediction failure test was satisfied at 5% level of significance for all four regressions. The prediction failure test is a powerful test against a very broad class of specification errors and, therefore, indicates that the model developed and estimated in this study is correctly specified. It goes without saying that the structural stability of a macroeconomic model is an important aspect of its reliabiilty as it is widely believe that the structural parameters of the economy are stable. Any structural analysis of the economy relies on the estimated parameters without which this interpretation may appear baseless. In the next part of this paper we use the estimated model to analyse its policy implications for the economy in the short-run equilibrium.

5. The IS-LM Curves and Policy Implications of the Model in Short-run

Having established the structural stability of the model we now explore the structure of the model through the determination of short-run equilibrium conditional on the expected values of the exchange rate and the price level one period ahead.

On the most general level, the credibility of an empirical model is dependent on a showing that its major features are consistent with mainline theory, and the latter is usually formulated in the IS-LM-BP terms for the analysis of stabilisation policy and in aggregate demand- aggregate supply, AD-AS terms for the analysis of the macroeconomic effects of supply shocks.

It is well known that establishing the elasticity of IS, LM and BP curves provides basic information about the predicted outcome of fiscal and monetary policies in a given model. The combination of inelastic LM and elastic IS implies fiscal crowding out and potent monetary policy, whereas elastic LM and inelastic IS lead to potent fiscal and weak monetary effects. estimation of these locuses therefore provides a useful diagnostic tool for characterising these policy responses in a given model.

5.1. The IS curve

To derive the IS curve we substitute for consumption function (C_t), private investment (Pi_t), export (foreign) demand (X_t) and import demand (Z_t) in the goods market equilibrium condition (i.e. AD=Y). Since the above estimated behavioural equations are all in log-linear form the goods market equilibrium identity also should be transformed to log-linear form. We linearise this identity by approximating it about the point of sample mean (see Gandolfo (1971) and Haque et al (1990)). By proper substitution and rearranging the equation for log P_t we arrive at the following aggregate demand functions:

$$(40) \ldots \log P_t = [-8.5 + .20 \log C_{t-1} - .7 \log \left[(i_t^* . e_t . Fp_t)/P_t \right] - .07 \log \left[(i_t . Dcp_{t-1})/P_t \right] + .76 \log K_{t-1} - 5 \log (Dcp_{t-1}/P_{t-1}) + .68 \log X_{t-1} + 1.7 \log Y_{t-1} - .11 \log Fr_{t-1} + .11 \log P_{t-1} - .11 \log e_{t-1} - .5 \log Z_{t-1}] + [.95 \log Y_t^* + 1.01 \log P_t^* - .3\, Dum + 1.01 \log e_t + 1.06 \log G_t + .21 \log Gi_t - .08 \log T_t - .29\, i_t + .29 \log EP_{t+1} - 5.9 \log Y_t]$$

Assuming all the other variables remain constant in the short-run we would have a downward curve in (P,Y) space for the aggregate demand. It will be noted that the equation of the aggregate demand takes the form:

$$(41.1) \ldots P_t = p(\underset{(-)}{i_t}, \underset{(+)}{EP_{t+1}}, \underset{(+)}{G_t}, \underset{(-)}{T_t}, \underset{(+)}{P_t^*}, \ldots\ldots)$$

which gives the model a fairly standard IS curve with the domestic price level expressed as a function of the nominal interest rate (i_t), the price level expected next period (EP_{t+1}) and exogenous variables such as government spending (G_t), taxation (T_t) as well as predetermined variables. Assuming goods market equilibrium and assuming the price level remains constant in the short-run, with output and interest rate as the main variables of the system, rearranging equation (40) for interest rate (i_t) we obtain:

$$(41) \ldots i_t = [-293.1 + 6.9\log C_{t-1} - 2.4\log\left[(i_t^* . e_t . Fp_t)/P_t\right]$$

$$- 2.4\log\left[(i_t . Dcp_{t-1})/P_t\right] + 26.2\log K_{t-1} - 17.2\log(Dcp_{t-1}/P_{t-1})$$

$$+ 23.4\log X_{t-1} + 58.6\log Y_{t-1} - 3.8\log Fr_{t-1} + 3.8\log P_{t-1} - 3.8\log e_{t-1}$$

$$- 17.2\log Z_{t-1}] + [32.7\log Y_t^* + 34.8\log P_t^* - 10.3\,Dum + 34.8\log e_t$$

$$+ 36.5\log G_t + 7.2\log Gi_t - 2.7\log Dtax_t + \log EP_{t+1} - 34.5\log P_t$$

$$- 203.4\log Y_t]$$

which gives a rather steep IS curve.

The interest insensitive of the IS curve that we are concerned with here, may fail the Keynesian effect. It is argued, that although the increase in real money balance through the Keynesian effect brings a fall in the interest rate, expenditure does not respond, leaving aggregate demand insufficient.

Considering real wealth as a determinant of expenditure (through the Pigou or real balance effect) could ensure that even in the two Keynesian limiting cases, the macroeconomic system will attain full employment equilibrium. The particular version of the wealth effect, proposed by Patinkin (1965), argues that if wealth include the real money balances, expenditure may depend on wealth, and thus real balances. Therefore, a wealth effect provides an additional mechanism whereby the economy could return to the equilibrium following a fall in aggregate demand.

The relevance of this argument to our case is that on the one hand we have derived a rather steep IS curve that considering the possibility of the liquidity trap renders expenditure insensitive to change in the price level in the absence of the Pigou effect. But on the other hand, in versions of the estimated consumption function we find a significant and positive real-cash balance effect on the aggregate consumption function that could be interpreted as the Pigovian effect on the private expenditure (see Morishima (1972)). Therefore, although the aggregate demand curve derived from the estimated model turns out to be rather vertical, however, on the basis of the estimated consumption function we can come to conclusion that assuming an increasing aggregate supply curve this ensures that the economy will settle at full employment.

5.2. The LM Curve

To derive the LM portion of the model we use the "shadow" money (eq.26) and the "shadow" interest rate (eq. 28) relationships of table (1). Substituting the balance of payments relationship into the foreign exchange reserves identity and the resultant relationship into the shadow money balance $(\text{i.e.} M_t = Dc_t + e_t . Fr_t + e_t . \Delta Fp_t)$ and linearising the equation yields:

$$(42) \ldots \tilde{M}_t = 2\log 2 + .25\log Dc_t + .25\log Ca_t + .5\log e_t + .25\log Fr_{t-1} - .25\log Fg_t$$

The only endogenous variable in this equation is the current account of the balance of payments (Ca_t). To eliminate this variable from the equation we have to write the current account's relationship in log linear form. We, therefore, approximate the Current account identity about the sample means which gives a log linear relationship for $\log Ca_t$ as a function of $\log X_t$, $\log Z_t$, $\log P_t$, $\log e_t$, $\log i_t^*$, $\log Fr_{t-1}$, $\log Fg_{t-1}$ and $\log Fp_{t-1}$. Substituting from the estimated regession of the demand for exports (log x) and the demand for imports (log z), into the current account equation and then the result for $\log Ca_{t-1}$ back in the above equation and rearranging the equation gives an expression for the real "shadow" money balance as follows:

$$(43) \ldots \log\frac{\tilde{M}_t}{P_t} = [1.078 + .04\log X_{t-1} + .05\log Y_{t-1} - .003\log P_{t-1} - .015\log Z_{t-1}$$
$$- .003\log e_{t-1} + .307\log Fr_{t-1} + .03\log Fg_{t-1}] + [.68\log e_t$$
$$+ .25\log Dc_t + .06\log P_t^* + .056\log Y_t^* - .05\,Dum - .935\log P_t$$
$$- .065\log Y_t + -.25\log \Delta Fg_t]$$

To eliminate the real "shadow" money balance from the above expression recall that we had derived the following equation for the "shadow" interest rate (i_t):

$$(29) \ldots \tilde{i}_t = -\frac{b_0}{b_1} - \frac{b_2}{b_1}\log Y_t - \frac{(1-\lambda)}{\lambda\beta_1}\log\left(\frac{\tilde{M}_{t-1}}{P_{t-1}}\right) + \frac{1}{\lambda\beta_1}\log\left(\frac{\tilde{M}_t}{P_t}\right)$$

where the "shadow" money balance $(\tilde{M}_t)$ in the model is defined as $(\tilde{M}_t = M_t + e_t . \Delta Fp_t)$. Estimation of the demand for money function provided us with the values of the structural parameters $(\beta_i, i = 0, 1, 2)$ as well as λ and ϕ. These value were $\beta_0 = -2.9$, $\beta_1 = --.005$, $\beta_2 = .53$, $\lambda = .48$ and $\phi = .62$. Substituting from equation (43) for $(\log(\frac{\tilde{M}_t}{P_t}))$ into the above estimated form of the "shadow" interest rate $(\tilde{i}_t)$ and rearranging the equation we arrive at the following expression for the "shadow" interest rate:

$$(44) \ldots \tilde{i}_t = [-1028.4 + 216 \log(\frac{\tilde{M}_{t-1}}{P_{t-1}}) - 16.6 \log X_{t-1} - 20.8 \log Y_{t-1} - 1.25 \log(\frac{P_{t-1}}{e_{t-1}}) + 6.24 \log Z_{t-1} - 127.7 \log Fr_{t-1} - 12.5 \log Fp_{t-1} - 12.5 \log Fg_{t-1}] + [-283 \log e_t - 25 \log P_t^* - 104 \log Dc_t - 23.3 \log Y_t^* + 12.5\, Dum + 389 \log P_t + 133.04 \log Y_t + 104 \log \wedge Fg_t]$$

which express the nominal "shadow" interest rate as a function of the price level, exchange rate and domestic credit. Assuming that money market is in equilibrium we can derive the models LM curve from the above relationship (44). The monetary aggregated controlled by the authorities in this setting is the stock of domestic credit (Dc_t). The shadow interest rate depends on credit policy, government external borrowing, the exchange rate policy, the current account outcome and money demand variables.

Substituting for the "shadow" interest rate from the above equation (5.15) into the domestic market determined interest rate relationship in the model $[\text{i.e. } i_t = \phi(i_t^* + \frac{Ee_{t+1} - e_t}{e_t}) + (1-\phi)\tilde{i}_t]$ yields:

$$(45) \ldots i_t = [-390.1 + 82. \log(\frac{\tilde{M}_{t-1}}{P_{t-1}}) - 6.3 \log X_{t-1} - 8 \log Y_{t-1} - 1.25 \log(\frac{P_{t-1}}{e_{t-1}}) + 2.4 \log Z_{t-1} - 48.5 \log Fr_{t-1} - 4.75 \log Fp_{t-1} - 4.75 \log Fg_{t-1}] + [-1081.6 \log e_t - 9.5 \log P_t^* - 39.5 \log Dc_t - 8.8 \log Y_t^* + 4.75\, Dum + 147.8 \log P_t + 50.5 \log Y_t + 39.5 \log \wedge Fg_t + .62\, i_t^* + .62 \log Ee_{t+1}$$

This gives the domestic market determined interest rate as a function of the domestic price level, domestic credit, and other exogenous and predetermined variables and represents the models LM curve.

$$(46) \ldots\ i_t = i(\underset{(+)}{P_t}\ ; \underset{(-)}{Dc_t}\ , \underset{(-)}{i_t^*}\ , \underset{(+)}{E(e_{t+1})}\ , \ldots\ldots)$$

Assuming fix-price level in the short-run, a rather steep LM curve from equation (45) can be drawn which is relevant at the point of the sample mean and neighbourhood of that point.

In the IS-LM framework the effectiveness of monetary policy in affecting aggregate demand is determined by the slopes of the IS and LM curves. Monetarist optimism about the effectiveness of monetary policy is frequently represented by a steep LM curve and a flat IS curve. In our case, however, while the IS curve has larger slope compared to the LM curve, but both IS and LM curves appear to be quite steep indicating the underlying interest-inelastic expenditure and demand for money function in this economy. We therefore do not appear to have either the monetarist or the Keynesian extreme cases in our empirical study of the Iranian economy. The IS-LM slopes give the impression that the monetary policy in this economy is impotent in affecting the real income in equilibrium level. It will be noted that while unlike the monetary approach, in which domestic monetary policy is impotent, in the Mundell-fleming model, from which our model has its main characteristics, monetary policy exerts some influence on equilibrium income. However, the same result can be obtained from a Mundell- Fleming model assuming zero sterilisation. Because an increase in the money stock will increase real income and reduce the domestic interest rate while the balance of payments remains in deficit. Balance of payments deficit in longer term in turn reduces the money stock returning the variables to their original values. On the other hand, considering the wealth effect it could be argued that a more accurate presentation of the monetarist mechanism would involve a simultaneous rightward shift of IS. reflecting a direct wealth effect on expenditure. Since there has been no extensive use of open market operations in this economy, the government's ability to sterilise balance of payments changes on the money supply is also limited, leaving some doubt about the exact effect of the monetary policy on the real income in the Iranian economy.

5.3. The External Balance (the BP Schedule)

As a flex-price version of the Mundell-Fleming model, our model incorporates the external sector of the economy and we now turn to the short-run equilibrium condition of the external sector of the model. To derive a BP schedule for the model we use the balance of payments identity , where, [i.e. $Bop_t = \Delta Fr_t = (1/e_t).Ca_t - (\Delta Fp_t + \Delta Fg_t)$] as before, Fr is foreign exchange reserves, is the current account of the balance of payments and Fp and Fg are foreign asset holdings of the private and public sector respectively. Substituting for Ca , from the current account identity [i.e. $Ca_t = Nft_t + P_t(Y_t - Da_t)$, where Nft is net factor income from abroad and Da is the domestic absorption] into the balance of payments relationship we obtain:

$$(47) \ldots \Delta Fr_t = (1/e_t).(Nft_t + P_t(Y_t - Da_t) - (\Delta Fp_t + \Delta Fg_t)$$

Substituting from the above relationship for ΔFr_t in the economy's foreign exchange reserves identity ($Fr_t = \Delta Fr_t + Fr_{t-1}$) and the result into the balance sheet identity ($M_t = Dc_t + e_t Fr_t$) we arrive at:

$$(48) \ldots M_t = Dc_t + e_t Fr_{t-1} + Nft_t + P_t(Y_t - Da_t) - e_t(\Delta Fp_t + \Delta Fg_t)$$

To linearise the above equation we approximate it about the sample mean which gives a relationship as follows:

$$(49) \ldots \log(M_t/P_t) = 2.5\log 2 + .125\log Dc_t - .25\log e_t + .25\log Fr_{t-1}$$
$$+ .125\log Nft_t + .125\log Y_t - \log P_t - .125\log Da_t - .125\log(\Delta Fp_t)$$
$$- .12\log(\Delta Fg_t)$$

Furthermore, substituting for $\log(M_t/P_t)$ from the above equation into the estimated money market equilibrium condition (i.e. the real demand for money function eq. (37)) and rearranging the equation we have:

$$(50) \ldots \log(\Delta Fp_t) = [12.5 - 6.6\log P_{t-1} - 7.4\log(M_{t-1}/P_{t-1}) + 2\log Fr_{t-1}]$$
$$+ [\log Nft_t - 2\log e_t + \log Dc_t - .92\log Y_t - 1.4\log P_t - \log Da_t$$
$$- \log(\Delta Fg_t) + .40 i_t]$$

With proper substitution for Nft and Da (the remaining endogenous variables in the equation) we can obtain a semi-reduced form equation for as $\log(\Delta Fp_t)$ follows:

$$(51) \ldots \log(\Delta Fp_t) = [7.9 - 6.6\log P_{t-1} - 7.4\log(M_{t-1}/P_{t-1}) + 2.5\log Fr_{t-1} + .25\log Fp_{t-1} + .25\log Fg_{t-1} - .8\log Y_{t-1} - .055\log P^*_{t-1} - .23\log Z_{t-1} + .32\log X_{t-1}] + [-.52\log e_t - .48\log P^*_t + \log Dc_t - 2.4\log Y_t - 1.8\log P_t - \log(\Delta Fg_t) + .45\log Y^*_t - .12\,Dum + .04\,i_t]$$

Therefore, changes in private sector holdings of foreign assets is expressed as a function of the interest rate (i_t), the price level (P_t) and other predetermined and exogenous variables, taking the form:

$$(52) \ldots \Delta Fp_t = F(\underset{(+)}{i_t}\ ;\ \underset{(-)}{P_t}\ ,\ \underset{(+)}{Dc_t}\ , \ldots\ldots)$$

This equation determines the magnitude of private capital flows. This latter variable is essentially a policy reaction function which gives magnitudes of capital outflows permitted by the authorities as a function of demestic and external variables affecting the degree of tightness in domestic financial markets (see Haque et al (1993)).

If we assume ΔFp is an exogenous variable, rearranging equation (51) for it gives the models BP schedule as follows:

$$(53) \ldots i_t = [-197.5 + 165\log P_{t-1} + 185\log(M_{t-1}/P_{t-1}) - 62.5\log Fr_{t-1} - 6.25\log Fp_{t-1} - 6.25\log Fg_{t-1} + 20\log Y_{t-1} + 1.37\log P^*_{t-1} + 5.75\log Z_{t-1} - 8\log X_{t-1}] + [13\log e_t + 12\log P^*_t - 25\log Dc_t + 60\log Y_t + 45\log P_t + 25\log(\Delta Fg_t) + 25\log(\Delta Fp_t) - 11.25\log Y^*_t + 3\,Dum]$$

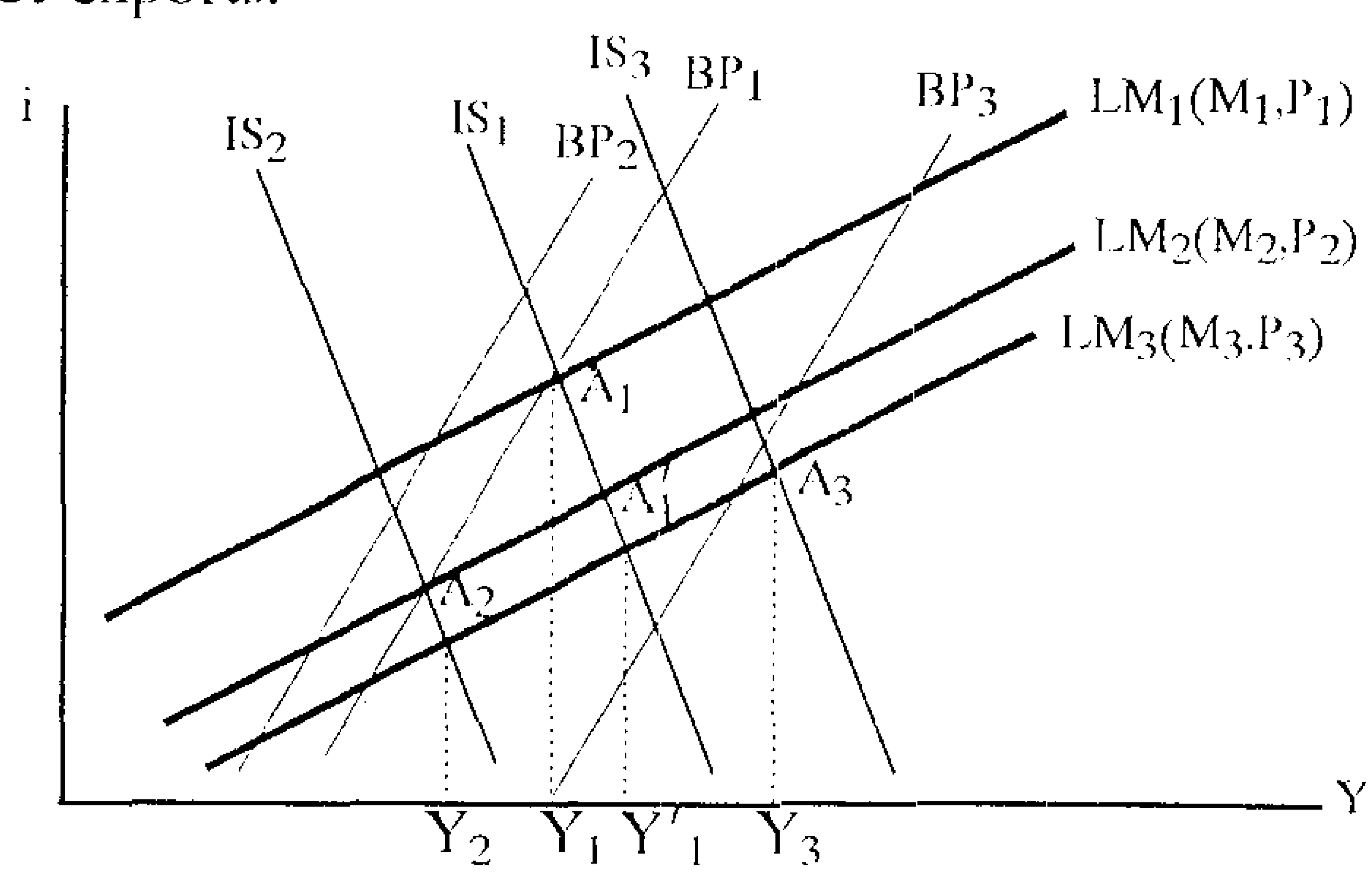
Assuming a fix-price condition in the short-run, we have a BP schedule with a larger slope compared to that of the LM.

The BP curve's positive slopes asserts our finding of some degree of interest sensitivity of the capital movements in the economy. Otherwise we would have evidence of a vertical BP line indicating capital immobility. The importance of this point is that in a Mundell-Fleming model, the result that internal and external objectives can be achieved by the appropriate fiscal - monetary mix relies upon at least some degree of interest-sensitivity of capitals mobility. In what follows we briefly discuss the policy implication of the model in the short- run equilibrium condition.

5.4. Price Flexibility, Internal and External Balance and the Fiscal-Monetary Mix

As was noted above the key result from the Mundell- Fleming model is that it provides a solution to the problem of securing simultaneously internal and external balances, solely by means of the appropriate mix of monetary and fiscal policies and without recourse to other balance of payments policies. Because the model is an open economy model the consequence of changes in the domestic price level stem from the presence of the international relative price term $(e_t . P_t^* / P_t)$, in both the IS and BP curves. An increasing domestic price level reduces competitiveness and therefore net exports, shifting the IS curve to the left. Similarly, an increase in the domestic price level means that a given real income level is associated with a larger current account deficit, requiring a greater capital inflow and therefore a higher interest rate to offset it, shifting the BP line to the left. We assume an upward sloping aggregate curve and therefore the price and real income effects operate in the same direction.

Suppose the monetary authorities increase the domestic money stock. Considering the policy change effect in Figure (1) this will shift the aggregate demand curve to right, increasing the income level to Y_2 and the price level to P_2. In IS-LM space this summarises three separate effects. First the nominal money stock increase shifts the LM curve to the right. Second, the increase in the price level reduces the money stock dampening the rightward shift in the LM. These two effects taken together shift the LM curve to LM_2. Third, the rise in price level reduces $(e_t . P_t^* / P_t)$ and therefore competitiveness declines shifting the IS curve to the left to IS_2. In addition, however, the fall in $(e_t . P_t^* / P_t)$ has also shifted BP line to the left, to BP_2 since decreased competitiveness dictated that for a given interest rate external balance now requires a lower domestic income. The relative size of the external deficit is unclear and depends on the relative price and income effects on net exports.



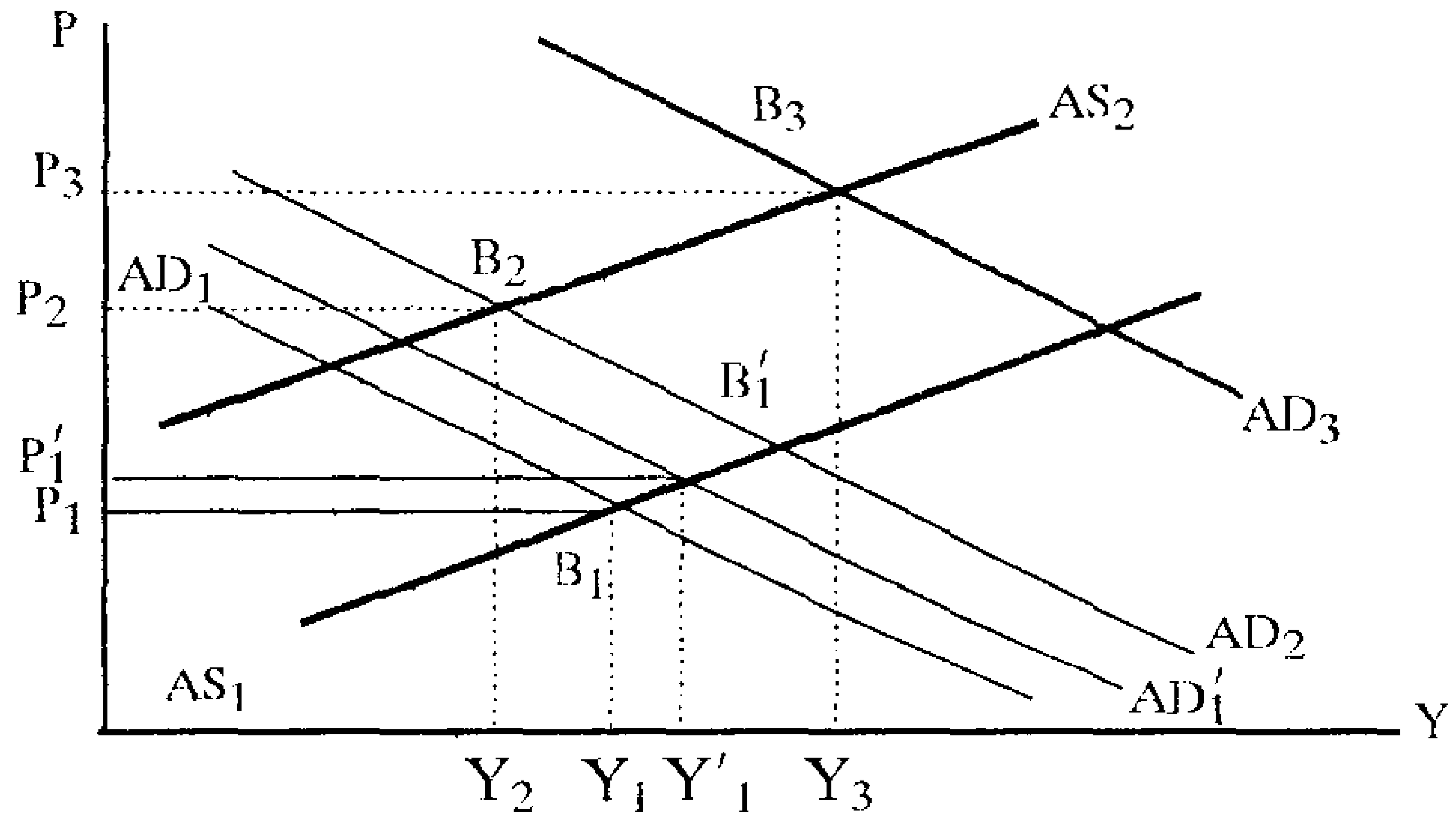


Figure 1 The Flex-Price and Monetary Expansion

Suppose that in order to finance public sector consumption there is a domestic credit expansion which shifts the LM curve to LM_2 . If the price level was assumed to remain constant, aggregate income would increase to Y'_1 with aggregate demand and aggregate supply adjusting at B_1. However, assuming a flexible price an expansion of money balance would induce a price rise that will reduce the economy's competitiveness. This would shift BP and IS to BP_2 and IS_2 respectively while assuming wealth effects of the money balance aggregate demand (AD) would move to AD_2. In the context of the Iranian economy, the government would intervene to prevent further reduction in foreign exchange reserves, for example by imposing imports compression. This in turn could lead to a fall in aggregate supply and AS shift to AS_2. The net outcome of the expansionary policy in this case as shown in figure (1) where the IS curve is steep and the LM curve is flatter than BP schedule is lower aggregate income $Y_2 < Y_1$ and higher price level $P_2 > P_1$. At this point therefore, the result of a monetary expansion is a deficit in the external sector and a decline in income level.

Suppose that in an attempt to stimulate economic growth the government increased its investment expenditure. This will have to be financed either by domestic credit or by the sale of bonds. However, it was noted that open market operations have not been a major source of finance of the public borrowing requirement in Iran so we assume the government will resort to domestic credit to finance its fiscal expansion. In this circumstances while a higher interest rate is required to increase capital inflow in order to offset the current account deficit, government credit policy would prevent rising of the domestic interest rates to attract foreign capital. On the other hand the rising price level would reduce competitiveness further deteriorating the balance of payments. A balance of payments deficit would not reduce the money stock because of the government sterilisation policy. A combination of fiscal and monetary policy in this case therefore fails to secure both internal and external balances. It seems thus, as Meade (1951) pointed out, if monetary and fiscal policies were employed to achieve internal balances then some other policy instrument was required to attain external balance. In terms of Figure (1) once monetary and fiscal polices have attained Y_1, additional policies are required to shift the BP line. Such polices might include for example exchange rate policy.

Consider an exchange rate policy of devaluation. This will increase the competitiveness of the economy and since the Marshall-Lerner conditionis satisfied this will shift the BP line to the right towards BP_3 Meanwhile government can increase its expenditure moving the IS curve to right to IS_3. The internal and external equilibrium could attain at point A_3 on LM_3 while aggregte supply and aggregate demand meet at point B_3. The government can assign the monetary policy to curb price increases and fiscal policy to induce income growth while the exchange rate policy is used to attain external balance thereby securing internal and external balance with higher income and albeit, higher price level.

6. Comparative Statics and Policy Multipliers

One of the main reason for performing an econometric study is that of using the estimated model for structural analysis. By structural analysis, we mean an investigation of the underlying relationships in the system under consideration in order to comprehend and explain relevant economic phenomena. Structural analysis therefore involves the quantitative estimation of all the essential causalities, static as well as dynamic, implied by the model. The basic step in structural analysis is the estimation on the coefficients of the structural as well as reduced form equation of the system. In addition to the estimation of these coefficients themselves, it is also concerned with the interpretation of certain coefficients or combination of them. The macroeconomic model constructed and estimated in this paper was supposed to represent the macroeconomics of the Iranian economy. The system of equations represented in their structural form expressed the endogenous variables as functions of other endogenous variables, predetermined and exogenous variables and disturbances. On the other hand, the reduce form equations describe the endogenous variables in term of the predetermined and exogenous variables alone. In the macroeconomic literature the reduced form coefficients are called "impact multipliers" since they measure the immediate response of the dndogenous variables to changes in the predetermined and exogenous variables (see Rao (19787)).

There exists a precise relationship between the reduced form coefficients and the structural parameters, since the reduced form parameters are obtained through the subsequent substitutions for endogenous variables.

Comparative statics is a method used by economists to analyse changes in the equilibrium of an economic model that result from changes in exogenous variables. In terms of calculus, comparative statics is concerned with determining the derivative of each of the endogenous variables with respect to the exogenous variables when the system wide effects of the model are taken into account and equilibrium is maintained i.e. the reduced form partial derivatives (see Cuthbertson and Taylor (1987)).

The purpose of comparative statics is to examine how the equilibrium values of the variables respond to change in one or more exogenous variables. An obvious use of the reduced-form partial derivatives, particularly in the macro context, lies in the formulation of policy prescription. Furthermore, if economic theory is to be meaningful it must have empirical content. By predicting the nature of changes in the endogenous variables resulting from a change in one or more of the exogenous variables in a model, the method of comparative statics describes features of that model that could be tested.

Generally speaking, an economic model, like the one developed and estimated in this paper, consists of n structural equations in n endogenous variables $y_{i\,i} = 1,\ldots,n$ and exogenous variables $x_{i\,j} = 1,\ldots,m$. Generally therefore we have:

$$(54)\ \ldots\ f_i(y_1, y_2, \ldots Y_n, x_1, x_2, \ldots, x_m) = 0 \qquad i = 1, \ldots, n$$

In our model for example as was displayed in tables (1) and (2) n=30 and m=14. For a given vector of the exogenous variables, x, the solution of the equilibrium equations entails an equilibrium vector of the endogenous variables y. The structural equations of our model are either in linear or log linear form. These equations are differentiable in the neighbourhood of (y',x') and considering the behavioural equations of the model it can be detected that the Jacobian determinant:

$$(55)\ldots \begin{vmatrix} \frac{\partial f_1}{\partial y_1} & \frac{\partial f_1}{\partial y_2} & & \frac{\partial f_1}{\partial y_n} \\ \frac{\partial f_2}{\partial y_1} & \frac{\partial f_2}{\partial y_2} & & \frac{\partial f_2}{\partial y_n} \\ \frac{\partial f_n}{\partial y_1} & \frac{\partial f_2}{\partial y_2} & & \frac{\partial f_n}{\partial y_n} \end{vmatrix}$$

is non-zero at (y',x'). This confirms that we can apply a mathematical result, the implicit function theorem, which asserts that each of the endogenous variables can be expressed as a function of the exogenous variables that are well behaved in the neighbourhood of (y',x'), that is:

$$(56) \ldots \quad y_i = y_i(x_1, x_2, \ldots, x_m) \qquad i = 1, \ldots, n$$

Equations (56) are referred to as the reduced form equations of the system. Now, we can solve (56) directly and derive our comparative static results straightaway, by calculating the matrix of the reduced- form partial derivatives:

$$(57) \ldots \quad \left[\frac{\partial y_i}{\partial x_i}\right] \qquad i = 1, \ldots, n \qquad j = 1, \ldots, m$$

and this we are able to do in our model.

6.1. The Impact Multipliers

To derive a reduced- form equation for $\log P_t$ we first obtain a relationship for $\log Y_t$ from equation (450 putting i=0. Then we substitute for $\log Y_t$ from this equation into equation (40). Rearranging the equation we arrive at:

$$(58) \ldots \quad \log P_t = [.27 \log P_{t-1} - .05 \log Y_{t-1} + .35 \log Fr_{t-1}]$$
$$+ [3.3 - .12 \log C_{t-1} + .04 \log Fp_{t-1} + .31 \log Dcp_{t-1} - .05 \log K_{t-1}$$
$$- .002 \log e_{t-1} - .013 \log Z_{t-1} + .004 \log X_{t-1} - .6 \log \tilde{M}_{t-1} + .006 \log]$$
$$+ [.3 \log Dc_t - .06 \log G_t + .005 \log Dtax_t + .71 \log e_t - .3 \log \wedge Fg_t]$$
$$+ [.005 \log Y_t^* - .006 \log P_t^*]$$

Reduced- form equation for $\log Y_t$ is obtained by substituting for $\log P_t$ from equation (40) into equation (45). Putting i=0, and rearranging the equation for $\log Y_t$.

$$(59) \ldots \quad \log Y_t = [.81 \log P_t + .3 \log Y_{t-1} - .08 \log Fr_{t-1}]$$
$$+ [-2 + .03 \log C_{t-1} - .005 \log Fp_{t-1} - .92 \log Dcp_{t-1} + .13 \log K_{t-1}$$
$$- .02 \log e_{t-1} - .08 \log Z_{t-1} + .11 \log X_{t-1} + .8 \log \tilde{M}_{t-1} - .00 \log Fg_{t-1}]$$
$$+ [-.05 \log Dc_t + .19 \log G_t + .01 \log Dtax_t + .05 \log e_t + .04 \log \wedge Fg_t]$$
$$+ [.16 \log Y_t^* - .17 \log P_t^*]$$

To derive a reduced form equation for $\log Fr_t$ we use the foreign exchange reserves identity i.e. $Fr_t = Fr_{t-1} + Bop_t$ and then the balance of payments identity (eq. 15) i.e. $Bop_t = (1/e_t) Ca_t - (\Delta Fg_t + \Delta Fp_t)$ where ΔFg_t and ΔFp_t changes to foreign assets holding of the public and private sectors respectively. After proper substitution and linearising the non- linear equations about the sample mean we end up with the following log linear approximation for $\log Fr_t$:

$$(60) \ldots \log Fr_t = \left[\frac{29}{16}\right] \log 2 + \left[\frac{9}{16}\right] \log Fr_{t-1} + \left[\frac{1}{32}\right] \log Fg_{t-1} + \left[\frac{1}{32}\right] \log Fp_{t-1} - \left[\frac{1}{8}\right] \log \Delta Fp_t - \left[\frac{1}{8}\right] \log \Delta Fg_t + \left[\frac{1}{16}\right] \log X_t - \left[\frac{1}{16}\right] \log \left[\frac{P_t^* . e_t}{P_t}\right] Z_t$$

In the above equation variables $\log\Delta Fp_t$, $\log X_t$ and $\log(P_t^* \, e_t / P_t) Z_t$ are endogenous variables to the model. To eliminate these variables from the equation we substitute from equation (51) for $\log\Delta Fp_t$ and from equations (34) and (35) for $\log X_t$ and $\log(P_t^* \, e_t / P_t) Z_t$ respectively. The result is the following expression for $\log Fr_t$:

$$(61) \ldots \log Fr_t = [-.30 + .24 \log Fr_{t-1} . 1 \log P_{t-1} + .92 \log M_{t-1} + .2 \log Y_{t-1} + .014 \log P_{t-1}^* + .08 \log X_{t-1}] + [.12 \log e_t + .12 \log P_t^* - .125 \log Dc_t + .175 \log Y_t + .17 \log P_t]$$

Now, substituting for $\log Y_t$ and $\log P_t$ from the reduced- form equations for these variables derived above (eq. (58) and eq. (59)) respectively we arrive at the following reduced form equation for Fr_t:

$$(62) \ldots \log Fr_t = [.001 \log P_{t-1} + .24 \log Y_{t-1} + .29 \log Fr_{t-1}] + [.6 + .003 \log C_{t-1} - .45 \log Fp_{t-1} - .11 \log Dcp_{t-1} + .01 \log K_{t-1} - .46 \log e_{t-1} - .02 \log Z_{t-1} + .1 \log X_{t-1} + .37 \log \tilde{M}_{t-1} + .005 \log Fg_{t-1} + .014 \log P_{t-1}^*] + [-.08 \log Dc_t + .023 \log G_t - .000081 \log Dtax_t + .25 \log e_t - - .04 \log \Delta Fg_t] + [.03 \log Y_t^* + .15 \log P_t^*]$$

We can put the reduced- form equations (58), (59) and (62) in matrix form which gives a clearer expression. The coefficients of those lagged variables which exhibited a negligible impact on all the target variables are omitted in the matrix form. Each element of the matrix (63), which is obtained by log-linearising the model's non- linear relationships at the point of sample means, indicates the magnitude of the direct and indirect influence of some predetermined variables, including the lagged endogenous variables, exogenous variables and policy variables upon the target variables of the macroeconomic model. For example the percentage change in the price level ($\log P_t$) induced by a 10 percent change in the domestic credit ($\log Dc_t$) is 3 percent $\left[\text{i.e. } \left[\frac{\partial \log P_t}{\partial \log Dc_t} = .3\right]\right]$ and by a 10 percent increase in the foreign exchange reserves in the pervious year is 3.5 percent $\left[\text{i.e. } \left[\frac{\partial \log P_t}{\partial \log Fr_{t-1}} = .35\right]\right]$. The percentage change in aggregate income caused by a 10 percent increase in government expenditure is 1.9 percent $\left[\text{i.e. } \left[\frac{\partial \log Y_t}{\partial \log G_t} = .19\right]\right]$ and by a 10 percent increase in the last period capital stock is 1.3 percent $\left[\left[\frac{\partial \log Y_t}{\partial \log K_{t-1}} = .13\right]\right]$. This matrix also implies that elasticity multiplier of the domestic credit on aggregate income at the point of sample mean is -.05 or $\left[\frac{\partial \log Y_t}{\partial \log Dc_t} = -.05\right]$. Also by use of the formula: $\frac{\partial \log Y_t}{\partial \log Dc_t} = \frac{\partial \log Y_t}{\partial \log \left[\frac{Dc_t}{P_t}\right]} \cdot \frac{\partial \log \left[\frac{Dc_t}{P_t}\right]}{\partial \log Dc_t} = \frac{\partial \log Y_t}{\partial \log \left[\frac{Dc_t}{P_t}\right]} \left[1 - \frac{\partial \log P_t}{\partial \log Dc_t}\right]$ we find that: $\frac{\partial \log Y_t}{\partial \log \left[\frac{Dc_t}{P_t}\right]} = (1 - 3)\left[\frac{\partial \log Y_t}{\partial \log Dc_t}\right] = -.071$. In other words the propotional change of aggregate income due to a 10 percent change in real domestic credit is -.07 percent. Similarly, a 10 percent devaluation of the exchange rate increases foreign exchange reserves by as much as 2.5 percent $\left[\left[\frac{\partial \log Fr_t}{\partial \log e_t} = .25\right]\right]$ while inducing a 7.1 percent rise in the price level $\left[\frac{\partial \log P_t}{\partial \log e_t} = .71\right]$, with all other predetermined variables held constant. We may generalise the concept of the multiplier so as to call each element of the matrix (63) an "impact elasticity multiplier; (see Morishima (1971)).

Matrix (63) Impact Multipliers of the Model in Terms of Elasticity

$$(63) \ldots \begin{bmatrix} \log P_t \\ \log Y_t \\ \log Fr_t \end{bmatrix} = \begin{bmatrix} .27 & -.05 & .35 \\ .81 & .30 & -.08 \\ .001 & .24 & .29 \end{bmatrix} \begin{bmatrix} \log P_{t-1} \\ \log Y_{t-1} \\ \log Fr_{t-1} \end{bmatrix}$$

$$+ \begin{bmatrix} 3.3 & .04 & .31 & -.05 & -.002 & -.004 & -.6 \\ -2 & -.005 & -.92 & .13 & -.02 & .11 & .08 \\ .63 & -.45 & -.11 & .01 & -.46 & .1 & .36 \end{bmatrix} \begin{bmatrix} 1 \\ \log Fp_{t-1} \\ \log Dc_{t-1} \\ \log K_{t-1} \\ \log e_{t-1} \\ \log X_{t-1} \\ \log \tilde{M}_{t-1} \end{bmatrix}$$

$$+ \begin{bmatrix} .3 & -.06 & .005 & .71 & -.3 \\ -.05 & .19 & -.01 & .05 & .04 \\ -.08 & .02 & .00008 & .25 & -.04 \end{bmatrix} \begin{bmatrix} \log Dc_t \\ \log_t \\ \log Dtax_t \\ \log e_t \\ \log \Delta fg_t \end{bmatrix} + \begin{bmatrix} .005 & -.006 \\ .16 & .17 \\ .03 & .15 \end{bmatrix} \begin{bmatrix} \log Y_t^* \\ \log P_t^* \end{bmatrix}$$

It should be noted that expressing the comparative static results in the form of elasticities is more convenient than in the form of absolute terms. The absolute multipliers depend on the ratios of the relevant variables and multipliers which in turn depend on the structural parameters of the model. We can derive multipliers in absolute terms from the corresponding multiplier terms of elasticities. For example the absolute impact multiplier of income with respect to the government expenditure depend on (Y_t/G_t) as the following relationship shows:

$$(64) \ldots \frac{\partial Y_t}{\partial G_t} = \frac{Y_t}{G_t}\frac{\partial \log Y_t}{\partial \log G_t} = (.19)\frac{Y_t}{G_t}. \text{ If for example } \frac{Y_t}{G_t} = 4 \text{ then } \frac{\partial Y_t}{\partial G_t} = .76$$

These absolute impact multipliers depends on the ratio of the relevant variables and elasticity multipliers which in turn depend on the structural parameters (i.e. the estimated coefficients of the behavioural equations and the coefficients of log- linearised identities). These multipliers are relevant only at the sample means because they are obtained fixing linearised relationships of the model to their sample means. If we take the actual ratios of the relevant variables (Y_t/G_t) and (Y_t/Dc_t) for example in each year of the sample period, contingent on linearised approximation of the model's relationships impact multipliers will vary from year to year. To illustrate this we have given impact multipliers of real domestic credit (Dc/P) and government expenditure (G) on the real aggregate income (Y) (i.e. $\frac{\partial / Y_t}{\partial (Dc_t/P_t)}$ and $\frac{\partial Y_t}{\partial G_t}$ respectively) for 5 sub- periods of the time period 1959- 91 in the following table (7). These multipliers are calculated using the ratios of real income to real domestic bank credit and real income to real government expenditure using relationships $\frac{\partial Y_t}{\partial (Dc_t/P_t)} = \left[\frac{\partial \log Y_t}{\partial \log (Dc_t/P_t)}\right]\left[\frac{Y_t}{Dc_t/P_t}\right]$ and $\frac{\partial Y_t}{\partial G_t} = \left[\frac{\partial \log Y_t}{\partial \log G_t}\right]\left[\frac{Y_t}{G_t}\right]$. Table (7) also gives the marginal substitution rate of real domestic credit, as the main monetary policy instrument, to government expenditure, as the main fiscal policy tool in the economy $\left[\frac{\partial Y_t/(\partial Dc_t/P_t)}{\partial Y_t/G_t}\right]$.

Table 7 Impact multipliers and marginal rate of substitution between domestic credit and government expenditure in the selected periods

period	$\frac{Y_t}{Dc_t/P_t}$	$\frac{\partial Y_t}{\partial(Dc_t/P_t)}$	$\frac{Y_t}{G_t}$	$\frac{\partial Y_t}{\partial G_t}$	$\frac{\left[\frac{\partial Y_t}{\partial(Dc_t/P_t)}\right]}{\left[\frac{\partial Y_t}{\partial G_t}\right]}$
1959-61	8.4	-0.59	6.7	1.3	-0.46
1963-69	6.3	-0.45	4.3	0.82	-0.56
1970-78	4.3	-0.31	2.9	0.55	-0.56
1979-87	1.6	-0.11	3.96	0.75	-0.15
1988-91	1.6	-0.11	5.4	1.02	-0.11

From table (7) it is apparent that the multipliers vary from period to period. It will be noted that in general real domestic credit multiplier on aggregate income $\left[\frac{\partial Y_t}{\partial(Dc_t/P_t)}\right]$ has a diminishing pattern as this multiplier decreases from -.59 in the period 1959-62 to -.11, in absolute terms, in the period 1988-91. Government expenditure multiplier on aggregate income decreases from 1.3 in the period 1959-62 to .55 in the period 1970-78 but increases again to 1.02 in the period 1988-91. diminishing pattern of the real domestic credit multiplier should be obvious because of decreasing ratio of income to real domestic credit. It is worth noting that domestic credit is a stock variable while aggregate income is a flow variable. This point should be noted when inspecting the marginal rate of substitution, between domestic credit and government expenditure on aggregate income, that gives a measurement of comparing the relative effectiveness of domestic credit policy vis-a-vis government expenditure policy. Table (7) shows that marginal substitution between real domestic credit and government expenditure is in favour of the fiscal policy instrument in its effect on aggregate income. However, we note again that while domestic credit is a stock variable, government expenditure is a flow variable.

As was mentioned an advantage of impact multipliers exapressed in term of elasticity is that it provides a dimensionless measure of the sensitivity of the endogenous variable to change in the exogenous variables and do not depend upon the units in which they are measured. For this reason a measure of the relative effectiveness of policy would be the ratio of elasticities. This could provide a comparison of the relative efficacy of fiscal policy as opposed to monetary policy as far as their impact on the price level, aggregate income and foreign exchange reserves are concerned. For example the marginal rate of substitution (see Morishima (1972) and Rao, (1987)) between domestic credit as the main monetary policy instrument and government expenditure as the main fiscal policy variable upon the aggregate income can be calculated as: $MRS_G^{Dc} = \frac{\partial \log Y_t / \partial \log Dc_t}{\partial \log Y_t / \partial \log G_t} = \frac{-.05}{.19} = -.26$ which clearly is in favour of fiscal policy in pursuing the aggregate income target. In table (8) we have presented the marginal rates of substitution of the policy instruments for the target variables in terms of elasticities. These multipliers and the rate of substitutions are useful in the sense that cast some light on the impact of different policy variables upon target variables and their relative effectiveness.

The results in table (8) indicate that in general the elasticity marginal rates of substitution at the point of sample mean are biased in favour of fiscal policy (government expenditure G_t) as far as aggregate income is concerned while monetary policy (Dc_t) tracks the price level target more accurately; and foreign sector policy instruments (e_t and ΔFg_t) are more effective on foreign exchange reserves. However, two points merit noting: First, tax policy appears to be almost completely ineffective in this economy relative to the other policy instruments. It should be noted that mainly due to the oil revenue which accrued to the government's budget, taxation has not been developed as the main source of government revenues. These results confirm that indeed taxation exerts a relatively small effect on the different economic target variables in this economy. Secondly, exchange rate policy turns out to be more effective in general relative to the domestic credit policy, which is regarded as the main monetary policy variable in the Iranian economy. The marginal substitution rate of the domestic credit to exchange rate, at the point of sample mean, is .42 (less than unity) indicating a more effective exchange rate policy on the price level. This could be due to several factors. First, the oil revenue received by the government is usually greater, in magnitude, than domestic credit (ΔDcg_t) extended to the public sector (largely to finance the government budget deficit) and often even greater than total domestic credit (ΔDc_t). A change in the nominal exchange rate therefore, can considerably effect on the nominal money supply. Secondly, as was discussed earlier, the lack of a sterilisation policy instrument denies the monetary authorities the means by which they could offset balance of payments or exchange rate devaluation effects on the money supply. Finally, a large percentage of the imported goods in this economy are inputs to produce final products. A change in prices of imports in the home currency terms affects a broad range of industries inducing a price increase.

Table 8 The marginal rate of substitution between policy instruments (in terms of elasticities)

[MRS	log P_t	log Y_t	log Fr_t]
MRS_{G}^{Dc}	-5.0	-0.26	-4.0
MRS_{Dtax}^{Dc}	60.0	5.0	1000.0
MRS_{e}^{Dc}	0.42	-1.0	-0.32
MRS_{Fg}^{Dc}	-1.0	-1.25	2.0
MRS_{Dtax}^{G}	-12.0	-19.0	250.0
MRS_{e}^{G}	-0.08	3.8	0.088
MRS_{Fg}^{G}	-0.2	4.75	-0.5
MRS_{e}^{Dtax}	0.007	-0.2	-0.00032
MRS_{Fg}^{T}	-0.016	-0.25	-0.002
MRS_{Fg}^{e}	-2.36	1.25	-6.25

To summarise the impact multiplier analysis of the model, it is fair to say that the set of impact multipliers presented in matrix (63) and the marginal rates of substitution between policy instruments of tables (7) and (8) help to draw a demarcation line between the economy's sectors on the basis of the policy. In general, it can be seen that monetary policy is more effective in the financial sector while fiscal policy is more influential on the real part of the economy which is in a true Mundellian fashion. However, impotence of the taxation policy and influence of the exchange rate policy should be considered as special features of this economy.

7. Summary and some conclusions

In the first part of this paper we presented a macroeconometric model for Iran. A summary of the estimation results was followed. Then Chow's first and second tests were applied to establish whether the main behavioural functions of the model have been structurally stable in the sample period. On the bssis of these tests we were able to conclude that constancy of the estimated parameters of the model, in the sample period, could not be rejected at the 5 percent level of significance. Since Chow's second test (the prediction failure test) is also considered as a powerful test of a broad range of misspecifications, these results ruled out any serious misspecification of the macroeconomic model.

Having established evidence of the model's parameter constancy for the sample period under observation, in the second part of the paper, the structure of the model was examined through the determination of its short-run equilibrium. IS-LM-BP curves of the model were derived to constitute a setting for the purpose of policy analysis in the short-run. The IS curve of the model turned out to be quite steep reflecting the underlying interest inelastic expenditure in the economy. The LM curve also was found to be rather steep but its slope was smaller than that of the BP schedule. The relative slopes of the IS-LM-BP curves indicated that an income growth, induced for example by the private or government expenditure, would generate a balance of payments deficit.

The policy implications of the IS-LM-BP curves, that exhibited neither extreme monetary nor Keynesian cases, were discussed with some consideration given to the wealth effect and sterilisation policy. Generally speaking, assuming zero sterilisation, monetary policy was found to be impotent (if the wealth effect is disregarded). A monetary expansion will increase real income and reduce the domestic interest rate while the balance of payments is in deficit. In the longer term, as the balance of payments deficit reduces the money stock, the variables return to their original values. However, while the system is adjusting, monetary policy is not neutral. On the other hand monetary policy could exerts some influence on the external balance. Fiscal policy can affect domestic real income expansion and its crowding out effect should be taken into consideration. When the fixed-price condition was relaxed a combination of monetary and - fiscal policy failed to secure internal and external balance. In this case additional of the exchange rate policy to the monetary -fiscal mix appears to be effective in persuading the economic growth with price stability and balance of payments improvements.

On the basis of the finding that agents in the economic model were largely unresponsive to the expected rate of inflation and the interest rate, we dropped these variables from our analysis in the last sectionof this paper, which was devoted to the impact multiplier analysis of the model. Derivation of the impact multipliers of the macroeconomic model enabled us to conduct a brief comparative static analysis of the Iranian economy. The marginal rates of substitution of policy variables were slso calculated. These highlighted the relative effectiveness of monetary policy on the financial part of economy and fiscal policy on the real sector of the economy.

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