CENTRE FOR ARAB URITY JORDAN

A PLANNING MODEL FOR JORDAN

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Table of Contents

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INTRODUCTION

This study attempts at building up a planning model for the Kingdom of Jordan. To start with,a brief description of the Kingdom's economy and its development over the past two decades is given. This helps to indicate areas of emphasis which have to be observed by the model and to point to cases where certain relationships may suffer from possible breaks. Further, the discussion is extended to cover potential changes in the future pattern of behaviour of some of the key factors that affect the country's development. This would help to indicate the basis for choice of alternative scenarios to be considered in the planning exercise. Some of these are treated later on in the study.

Besides the characteristics of the economy itself, another determinant of the model structure was the availability of data. A brief discussion of data issues is made, and their implications for the structure of the model are indicated.It is worth mentioning here that we have eventually settled on a formulation based on the system of national accounts including series at both current and constant (1985) prices. Although such accounts exist for Jordan since 1952, the estimation period is confined to the period 1967-1985 and they relate to the East Bank as it stands now. Before that the data relate to both Banks together, i.e., to a different economy.

In the light of the above considerations, the structure of the model is discussed. The system of equations is presented in five blocks:

a) Domestic output, overall and sectorial;
b) Domestic Expenditures;
c) The External Sector;
d) Transfer Transactions; and,
e) Labour Force and Employment.

For each block of the system an outline of the desirable structure is given. This is then discussed in the light of data limitations, and alternatives are suggested. Equations of the block are then taken one by one and alternative formulations are examined in terms of economic theory and statistical findings. As mentioned above, the estimation period is limited to the period 1967-1985,i.e., 19 points only. At this point we want to indicate that owing to the relative sizes of both the number of variables and the points of observations, we were forced to remain content with SELS estimates. More refined methods of estimation would have called for much longer series than would be conceivably available. This restriction is not quite serious since our main concern is with predictive properties of the model rather than rigorous structural estimation.

(*) For the preparation of this study, Dr. Mohammad Mahmood Al-Imam served as a consultant to the Centre for Arab Unity Studies.

To test the predictive powers of the model we applied tests of validation of the model using well-known techniques. This had been confined to the historical period since we employed all available data in the process of estimation, and there remained no post-estimation-period data to run tests beyond the estimation period. First there was need for solving the system of equations simultaneously. This called for dicussing computational problems involved in a model of the present size. The algorithm used is outlined in terms of the "Lotus-123" package using an XT Personal Computer. This package is selected on the grounds that it is available to, and had been actually used by, the Jordanian Planning Ministry.(*)

Finally, the model is worked out for the five years 1986-1990 which is the current plan period. For this purpose alternative assumptions are made for the set of exogenous variables to build up alternative scenarios. The results are compared with the planned figures, and their implications are appraised. Further potentials of utilizing the model are oulined. One interesting feature about the model is that it can be used to appraise alternative economic policies. It goes without saying that as time goes on, the model can be appraised in the light of new information, amendments made if necessary, and predictions extended for further periods.

Let us now turn to the examination of the economy and its developments over the last two decades, bearing in mind the need for uncovering some of the factors that affected the performance of the economy, and which stand out as particularities of the country.

(*) See, Jordanian Ministry of Planning: "A Mathematical Framework for Determining the Plan Frame". (Revised, 3 August, 1985;mimeographed) p.14. A copy of this memo. was made available to us through the courtsey of H.E. Dr. Taher Kanaan, Jordan's Minister of Planning.

I- ECONOMIC STRUCTURE AND DEVELOPMENTS:

For the purpose of anlyzing the structure of the country and highlighting its developments within the scope of the needs of the present study, we did not follow the traditonal techniques of estimating and analyzing underlying causes of change in rates of growth (or,in fact, change) of series representing major economic phenomena. Such information is already available in the publications of international organizations, and in other sources, the most recent of which is the document for the 1986-1990 plan. Rather we have estimated and compared two sets of sums of available national accounts data.The first relates to the period 1968-1972, while the second covers the period 1981-1985. The first period is chosen so as to fall at the beginning of the range covered as previously indicated. It has also the merit of covering the span of time that falls between the two Middle-East wars of 1967 and 1973. The 1973 Ramadhan war dramatically affected the conditions of the whole region, particularly Jordan. It initiated the oil boom and coincided with the beginnings of the lengthy world stagflation, both leaving wide marks on the Jordanian economy as will be presently shown. In fact the country suffered from a state of stagnation up to 1973, as may be observed from the poor rate of growth and the modest capital accumulation observed for that part of the period covered. The remainder of the seventies witnessed continuous adjustments to the new conditions, including migration and rapid price increases in import prices of energy and other materials. On the other hand, the comparative 1981-1985 period includes the latest five years, and thus summarizes the information for the the last part of the period studied, ending in 1985 which is the base year for the present planning period. Further, it covers the closing scene of the oil boom, paving the way for substantial changes in the factors determining the performance of the Jordanian economy, at present and for some time in the future.

The first part of Table (1) represents the **domestic aggregates** of the country expressed as **percentages of GDP in 1985 prices.** The last column gives the percentage change in those ratios in the second period from the first. A number of observations are due:

* There had been a marked change in favour of the secondary sectors (manufacturing, electricity & water and construction sectors). Their share in GDP at factor cost rose by more than 50%. This was realized at the expense of the tertiary sectors. Unlike many countries in the region, public administration services did not keep pace with other sectors, which resulted in a drop in the share of services.
* The ratio of imports to GDP at market prices rose from the high level of 58% to nearly double that value, showing an excessively high marginal rate of importation. At the same time, exports rose from the modest figure of 14% to over 50% of GDP,causing its share to quadruple. But stil the resource gap rose from 44% of GDP to the higher ratio of 59%. While

this does indicate an increase in the degree of dependence on the rest of the world, it calls for a careful analysis of the future potentials of exporting capabilities, and the ability to finance higher - or even similar - rates of importation. It should be mentioned here that the 1981-1985 plan envisaged quite high rates of growth in exports over the plan period, but actual period-total of exports of goods reached only 57.3% of the target. Again the growth of services exports realized a rate of 3% against the planned rate of 13.6%. On the other hand it is indicated that the rate of growth of imports of goods during the 1981-1985 period was 3.9% against the planned rate of 13.8%. Hence the ratio of imports to GDP in 1985 was in fact lower than the planned ratio by 10%. This has also contributed to the fall in the imports of services, especially transportation, below the plan targets.

* Private consumption has come closer to matching GDP at factor cost. On the other hand, the share of public consumption in GDP marked a 33% drop, bringing it down from over one-third to one-fourth. This was reflected upon the share of the tertiary sectors as mentioned above. This also helped to dampen the impact of rising household consumption; hence the rate of total consumption fell by about 4%, which brought down that of dissaving by 18%.

* However, the rate of gross capital formation more than doubled, rising from 18% to about 38%. This outmatched the drop in the rate of dissaving, which explains the widening of the already wide resource gap, and the increase in the heavy reliance on external resources.
* The rise in investments was coupled by a rise in depreciation allowances, whose rate to GDP jumped from 4% to 8%. This goes with the shift to the more capital-intensive activities of the secondary sectors. It may be conceived to indicate a general intensification of capital utilization as a result of the shortage of manpower due to migration as will be shown later on. However, our tentative estimates of the capital stock indicate a fall by about 8% vis-a-vis GDP, in spite of the recent sluggishness in the rate of growth which started in 1983. This is also reflected in the fall in our estimate of the average capital/output ratio by about 5%, from 4.7 to 4.5. Such obervations may be due to less efficient utilzation of the available capital stock at the earlier period, which is an indication of a systematic deviation from the contours of the production function, corrected later on - at least partly - over time. More has to be said on this when we examine the production function for the economy.

The second part of Table (1) relates to **population and the labour force**. Over the last two decades, the population of the East Bank grew by 3.94% p.a. The country is one of the few particular cases in the Arab Region where migration works both ways. Apart from the dislocations arising from continuing Israeli aggressions, migration of Jordanians, particularly to the Gulf

area,is quite substantial. At the same time, Jordan is one of the very few cases where the principles of the Arab Common Market are seriously observed.Consequently free entry and gainful occupation is admitted to Arabs, especially nationals of the ACM. But the excessive migration of Jordanians opened the door for the inflow of other nationalities as well. However the situation seems to be blurred by the fact that nationals of the West bank holding Jordanian passports are included in the migration (and possibly remittances) figures. This is one of the main reasons for the treatment of the whole of the errors-and-ommissions item in the accounts of the East Bank household (private) sector. The indicators given in Part II of Table(1) show some interesting features.

* In spite of the vigorous labour force movements, the rate of participation of nationals has fallen from about 22% to 19%, a fall of 12%. Both rates are quite low, especially if we notice that age-composition and female participation are more favourable than those, e.g., for Gulf countries with equally low rates. Although we have taken into consideration the esimates given in the 1986-1990 Plan document, that latter mentions a rate of 21% in 1985, and another of 22% in 1979, with a female particpation rate of 12.5% in 1985 as against 7.7% in 1979. The Plan estimates are equivalent to those published by the IBRD (e.g., in World Tables) which indicate a drop from 23% in the first period to 21.4% in the second. Part of the explanation of the drop (but not the low level) may be the fact that resident nationals include families whose bread-earners are temporarily residing abroad. This would have evidently affected the 1979 population census data which brought out the lower rates.
* The Plan document's estimates of the balances in 1985 are striking. Out of a population of 2.7 million, half a million are joining the labour force, one third of a million are employed abroad, while some 0.14 million are expatriates. Nevertheless, the 1985 rate of unemployment was estimated at 8%. Our estimates show an average rate of unemployment for the period 1981-1985 of 5.3% as against 8% for 1985, which is an indication of a rising rate of unemployment. If we take into account that some migrants are accompanied by their families, the estimates of Jordanians abroad would look quite high. In fact the migrant labour force amounts to 68% of the domestic; and even if we assume for it half the domestic rate of dependency,the total migrant population may be about 40% of resident population. These obervations cast strong doubts on many labour force and population estimates and projections. This is quite relevant for movements in the immediate future, since a drop is anticipated in the rate - and perhaps the absolute level - of migration due to recent and expected conditions in the Gulf countries. The same conditions call expatriates to stick around since they will be having smaller chances of moving to other countries in the Gulf.
* The lack of ample data on employment has led planners to apply a flat rate of unemployment of 8% to the estimates of workers in all broad sectors. This is rather unsatisfactory,

since selectivity in migration normally hits certain professions having different weights in different sectors. In such conditions of high (geographical) mobility and low participation rates, it would be quite difficult to defend such an assumption. Thus either the structure of the labour force or that of employment, or both, are unrealistic. The issue requires more serious examination both statistical-wise and policy-wise, especially in the present and expected circumstances.

* With the above qualifications, we have attempted estimating the breakdown of labour force and employment by sector. Table (1) shows a marked fall in the share of the primary and distribution sectors, with a shift to the secondary and tertiary sectors. The structure, when compared with that of GDP at constant prices reflects some changes in relative productivities. The rise by 1.4% in the share of the primary sectors' value added was accompanied by a drop of four times that figure, viz., 5.6% in their share of employment, leading to a one-third drop in their relative share. On the other hand the falling share of the dirstribution sectors in employment was accompanied by about one-fifth as much fall in their relative value added share. The tertiary sectors gained in employment while losing in their share of GDP. The secondary sectors were outstanding in their gains both in value added and in employment.
* More interesting still is the observation that the capital/labour ratio showed an increase of one-sixth. The fact that this was accompanied by a drop in the capital/output ratio by 5% led to a rise in labour productivity by about 23%. In other words, as time went on, a unit of output required less of capital and much less of labour.This may be an indication of a significant "learning" factor, hence a positive trend in the production function. However, another way of explaining this observation will be examined during the discussion of the formulation of the production function. At the same time the above observations suggest some substitution of capital for labour over time. This has to be allowed for in that function.

In spite of our attempt to build up a detailed set of deflators, we shall confine further analysis of the economy to **series in current prices.** The results are shown in part III of Table (1). The first section of this part reflects, by and large, observations similar to those based on series in constant prices. However, more may be derived from comparing the two sets of indicators.

* The relative rise in the share of primary sectors in constant prices was accompanied by a larger relative fall in their shares in current prices. Tertiary sectors moved more or less at the same pace in both cases, which may be partly due to the specific methods of their statistical estimation. But the net result is a much faster rise in the share of the secondary sectors in current prices both absolutely and relatively. Relative price considerations seem to have been

working in favour of the fast expansion of these sectors.

* While indirect taxes net of subsidies had fallen by one-third in constant prices, they indicated a modest increase of 6% in current prices. This is the result of a combination of a number of factors. First, there is the rise in the rate of importation, which generally calls for a rise, in both cases, in the ratio of indirect taxes to the same GDP. As will be indicated later, the change in customs receipts was better correlated with imports in constant rather than current prices. Second, expanding trade with partners in the ACM would work in the opposite direction; but its relative size remains limited. Third, more industries are receiving subsidies in recent years. Agriculture has also joined the subsidy recepients lately. However, the extent of subsidization has fallen since the late seventies when they helped to ease difficulties arising from the high energy costs. Nevertheless subsidies usually increase in those cases which experience faster increases in current factor costs. This would be reflected in series at current prices rather than in constant prices. With the tightness in economic conditions there may be a temptation to raise the rates of indirect taxes. The point deserves special attention for policy consideration in any planning exercise. Hence there is need for treatment of the components of this item during the process of building up the system of equations.
* There was a clear change in favour of the compensation of employees in spite of changes in sectorial structures in favour of those activities characterized by lower wage components. There had been a rise in the share of wages in the non-tertiary sectors. Figures for the tertiary sectors are dominated by the public administration sector, while methods of estimating other services could have played a part. If we apply the initial wage shares to the recent GDP structure, the overall share would have fallen from 45.5% to 43% rather than the actual 48.4% of GDP at factor cost.
* With the rise in both compensation of employees and depreciation allowances, the share of net operating surpluses fell by about 13%. These changes may have contributed to a rise in household final consumption. The point calls for investigating possible effects of changes in income distribution on the consumption function, as well as on direct taxes.
* In nominal terms, household consumption has risen slightly slower than in real terms. Its share in GDP at market prices is only 92%; but this marks a rise from the previous percentage of 85.5%, as against 95% and 87% respectively. These differences reflect discrepancies in relative prices. Public consumption's share fell at a lower rate than that of its share in real terms. The net result was a slightly weaker fall in the share of total consumption. But the shares are lower in current prices than in constant prices. Hence the rates of dissaving are smaller, and their improvement is half as much, being 13.5% only, as against 18.3%. The fact remains that the fall by one quarter in public consumption was the major cause of the fall in the rate of dissaving.

Factors governing public revenues and expenditures, in both current and constant prices, deserve particular attention in an economy so heavily dissaving.

* In spite of the rather high rates of domestic dissaving, the rate of GFCF more than doubled in both current and constant prices, rising from about 17% of GDP in the first period to about 37% in the second. Consequently total domestic expenditure rose by 12% as against 10% in real terms. This raised the resource gap to 55% of GDP, a rise of 45% as compared with one third only in real terms. These figures indicate the heavy reliance of the Jordanian economy on the rest of the world. This deserves particular attention during the structuring of the model, in selecting both variables and equations.
* Exports held practically similar positions in both sets of prices, with a tendency to rise faster in current prices. As mentioned before imports rose considerably, and the rise reflects higher costs over time. Taking 1985 as 100 for both domestic and foreign prices, the relative price of imports was 86.8% (= 50.1/57.7 * 100) in the first period and 95.8% (= 104.2/108.8 *100) in the second which includes the 100% of 1985. This expresses the tendency of the economy to finance, not only increasing quantums of imports, but also higher prices to procure them. This is a reflection of large transfers from abroad, and the importance of relative price considerations. The problem is further investigated in both the data and the model sections.

Part III.3 of Table (1) indicates stability in the **composition of exports** of national goods by major group, although the structure of consumers goods changed in favour of current goods, and more markedly for durables, at the expense of the relative share of food items.It is worth mentioning that the share of phosphate remained 29% as in the former period. This means that it grew at the same rate as total exports, hence it bypassed the domestic growth rate as had been mentioned earlier with respect to the share of the extractive sector.The modest share of capital goods fell by over one-third, which is a reflection of the nature of the specific industrialization policy adopted over the past two decades. Moreover, re-exports maintained their relative position of about 28% of domestic exports.

On the other hand, the **structure of imports** reflects larger changes in both groups and subgroups.

* The major rise was in the subgroup of oil and mineral fuel, which is of course due to the large increase in oil prices. This component amounts to one fifth of total imports of goods, and practically swallows up receipts from exports, whereas it amounted to 36% of such receipts in the earlier period. A fall in the latter would easen the burden on this account, which may be relevant for the immediate future. The point has a bearing on subsidies also.
* As a result,the ratio of raw material imports to the corresponding domestic use, viz., intermediate consumption, showed

the highest rates of change among the ratios to domestic uses. Even if we exclude fuels, the ratio of other raw materials to intermediate consumption would have been found to have risen from 10% to about 16%, a rise of 58%. Apart from differences in price changes, this shows that the expansion of the productive system was accompanied by increased reliance on production requirements from the rest of the world. The present ratio of 30% may be then subject to two opposing trends: a drop which would be in line with the recent fall in oil import prices; and a rise due to any persistence in the higher rate of reliance on other imported raw materials, and may be also oil itself.

* Imported capital goods have also tended to represent a higher percentage of the corresponding domestic use: capital formation. In spite of the observed large increase in the rate of capital formation itself, those imports represent now 63% of capital formation compared with the previous 51%. While the ratios relate to five-years averages, they are functions of the types of investment activities undertaken, and need not represent a change in structure or a trend. Normally, as the process of dvelopment goes on,the construction component tends to leave more place for machinery and equipment; and these remain for some time to be imported from the industrial world. Future patterns would essentially depend on the investment activities chosen. The recent ratio is high enough and may not be exposed to further increases in the future.

* The story told by imports of consumers goods is quite interesting. Price differentials and differences in the expansion of domestic production capacities put aside, the changes fit with Engel's law ; With the growth of income there occured a shift from the basic food items to current consumers goods, and from both to durables. Food imports, which remained around 9.5% of total final consumption in both periods, suffered from a more than 50% drop in their relative share; current goods from a drop of about 30%, while durables exhibited an increase of 24%. The ratio of imported durables to total consumption rose from 1.9% to 5.1%. One has also to take into consideration the impact of the demonstration effect on migrants - who are exposed to extravagent consumption patterns in the Gulf area - and from them to residents. With the fall in migration rates and the expectation of lower earnings and remittances, the growth of durables may be somewhat held back. It would be also affected by changes in the structure of domestic production if these give more weight to import substitution in these types of goods. Alternative changes in the rates of importation of the different categories may be left to scenario exercises.

* Finally, the ratios of foreign balances, i.e., imports less exports of each category to the corresponding domestic use, complete the story. Consumers goods represent the least rate of increase, reflecting the tendency of the economy to give more weight to the production and exportation of this category of goods than the others. Capital goods follow, and their ratios are quite close to those of imports, due to the

modesty of their exports in both periods. Finally, in spite of the importance of exports of phosphate and other raw materials, the quicker growth of imports of raw materials led to a higher change in the balance than in imports themselves.

Taking trade in goods and services together, we first notice a sharp rise in the relative share of **nonfactor services exports**. While the share of travel remained practically constant, that of other services nearly tripled. Two facts are worth mentioning here. The first is the fact that travel, keeping pace with the increase of total exports of goods and services, has its share more than quadrupled when related to GDP. The second is that the exports of services grew during the period 1981-1985 by 2.7% only, as against 13.6% envisaged by the plan for that period. One key element in these exports is the transit trade via Aqaba port, which was lately affected by adverse trends in some neighbouring countries. Further improvements in the performance of exports of services are thus largely governed by conditions in other countries in the region.

Imports of services have also shown similar patterns, with the travel component slightly declining in importance, while other services gaining over 50% increase in their ratio to total imports which were noticed to have doubled in their ratio to GDP. Accordingly, both imports of goods and of travel services have nearly doubled in relation to GDP, while other services have tripled. It should be mentioned that the rate of growth of other services imports between 1981 and 1985 was 3%. The rise in the imports of other services did not reach planned figures due to the stagnation of the economy and the fall in the growth of imports of goods, and the corresponding transportation services.

Disposable income, and the **redistribution process** indicate some of the pecularities of the Jordanian economy.

* Following the practice of the Statistical Agency, the business sector, both private and public, is not differentiated. Hence the calculation of household, or rather, private, disposable income starts with net domestic product at factor cost. As mentioned before, compensation of employees rose in the second period, while the share of operating surpluses, both gross and - particularly - net, went down. The share of the public sector is apparently treated through the figure for transfers from the private sector to the government. The first step is to net out such transfers to obtain the private net domestic disposable income. It is interesting to notice that direct taxes have increased appreciably and at the same time the transfers from the government increased equiproportionately. The final result was an increase in the share of the private sector by 5 points in the comparative period against 2 points only in the initial period. This represnts the outcome of the domestic redistribution process.
* The major element in the national private disposable income

is the remittances of migrant workers which increased nine-fold. This was slightly affected by remittances of expatriates, with the result that an extra gain of 12 points was realized against one of 3 points only in the initial period. Another point was gained in both periods as a result of net external transfers. Hence private disposable income, which amounted to 90% of GDP at market prices in the first period, has risen to 109% in the last period, with a gain of about 28 points rather than the 6 points realized in the initial period. This turned the slight drop in the share of the private sector in domestic disposable income to an increase in its national disposable income over the initial period equivalent to 20.5%. Accordingly net savings have risen from below 5% to 17%, i.e., three and half times.

* The rise in the private share of domestic income was evidently matched by a fall in that of the government. There was also another drop in the share of income from investment abroad, ending with a loss of 5 points between the two periods,which amounts to over one-third drop in the national income share of the government in terms of GDP. A further drop of 3 points in current transfers from abroad left the government worse off by 8 points or a drop of 20% in its share of disposable income. On the other hand, public consumption lost 9 points which helped to add one point to net savings. It is interesting to note that in spite of the fall in the importance of external transfers at the national level, they have recently amounted to about three times the domestic revenues, whereas they were only double those revenues in the initial period. This is another feature of the increasing rate of dependence on the rest of the world.
* To sum up, the national picture reflects the ability of the country to exceed its means in terms of GDP by 30% and 40.6% consecutively. Whereas net workers remittances added 16.6 points, net income from investment abroad led to a loss of 3.6 points, and net external transfers added another loss of 3 points. This helped to more than doubling the rate of net national saving from 10.6% of GDP to 23.8%. But the growth of the rate of investment led to an increase in net borrowing from 3.5% to 6.8%. This indicates the key role played recently by workers remittances in the face of decline of all other sources measured in terms of GDP: NDP at market price, incomes from investment abroad, as well as net current transfers. They enabled the private sector to expand both its consumption and savings. Such conditions fostered investment activities driving them beyond double their initial share of GDP, which meant a doubling of the rate of net borrowing from the rest of the world from 3.5% of GDP to 6.8%.

The above discussion has its implications for the **structure of fincancing capital formation.** The last part of Table (1) gives the relevant information.

* For the private sector both net and gross domestic savings have become negative. This is in contrast to the initial

positive values of both items. Thus the sector shifted to a state of living beyond its domestic means. In the initial period workers remittances helped to finance 30% of private capital formation. To this another 12.4% was added via current transfers (including Errors & Ommissions in the Balance of Payments).This raised the available financial own sources to 88.4% of capital formation, leaving 11.6% to be financed through net borrowing. Thus the order of importance was as follows: First come gross domestic savings (45.9%), followed by workers remittances (30%), then by net external transfers (12.4%) and finally net borrowing (11.6%). This helped to cover private capital formation which amounted to 11.7% of private disposable income (or 10.6% of GDP at market prices).

* In the comparative period private capital formation rose to 17.5% of private disposable income(or 19.1% of GDP at market prices).This was wholly financed out of workers remittances. In fact both net and gross domestic savings were negative, the latter being -8% of capital formation.External transfers fell down in importance by about 36%; and if E & O are included, the total represents a negative 3% thus bringing up the sum of negative elements to 11% of capital formation. Another 6% was lost through net investment income from abroad.This still left about 6% of the net inflow of workers remittances to stand as net lending of the sector. In other words, gross remittances which amounted to 23.3% of GDP at market prices, were utilized as follows:

18.9%	to meet remittances of expatriates;
5.2%	to meet gross domestic dissavings;
3.9%	to meet net investment income due to R.o.W.;
2.1%	to meet net transfers to R.o.W.;
66.5%	to finance gross capital formation; and
3.4%	remains available as net lending.

* With the expected fall in net remittances,the scene is going to change. A tentative assessment of directions of change runs as follows:
  - A backward migration movement is bound to start in view of expected conditions and policies in the Gulf countries.
  - Some home-comers may bring back some of their accumulated savings held abroad. This may hold up remittances for some time; but inflows are bound eventually to dwindle down.
  - Returning migrants will be seeking gainful occupation either as employees or as investors. Their success depends on the favourability of demand conditions. Since the adverse conditions in the region depress some of the domestic activities, success may be limited. There will be a market squeeze liable to lead to a cut in wage rates.
  - There will be an exodus of some expatriates being replaced by returning nationals. Outflows of remittances will also go down, especially with the expected cuts in wage rates.
  - Household consumption will rise for some time before the fall in domestic rates of earnings brings about adjustments. Domestic savings are bound to fall.
  - Both incomes from external investment and external transfers are expected to fall further (larger negative values).

- There will be need for raising means through net borrowing and eventually cutting down the rate of investment.

This is the most expected scenario under present conditions. Alternative solutions have to be sought, forming the subject-matter of other scenarios. This will be considered later. The main point we want to stress is that the recent developments require the model to follow the chain of effects and provide an integral part for workers remittances and other relevant external variables.

* The government sector's capital account tells a somewhat different picture, though the essence is the same. In this case both gross and net dissavings have improved, but the rate of income from investment abroad has fallen in importance to one-seventh of its past value. In both periods the key role is played by current transfers from abroad. Such transfers closed the gap by over three-quarters in the initial period, leaving the fourth quarter for net borrowing. With the rise in the rate of public investment during the second period and the fall in financial sources, about half of gross capital formation has to be financed through borrowing.
* With the expected changes in the conditions of the private sector and the gloomy picture for the whole region, the internal as well as the external revenues of the government are expected to suffer. There will be pressures to keep up current expenditures, both public consumption and current transfers. The continuous net borrowing in the past and the expected new borrowing will put a limit to any attempt to expand the rate of investment. One of the major concerns of future planning exercises is to attempt optimizing the rate of public investment in such a way as to alleviate the growing unemployment rate and to correct for the effects of adverse conditions, watching all the time the safety of the national debt position.
* The national picture is the net resultant of the above. In the initial period both net and gross domestic savings were negative and their absolute values surpassed the level of gross capital formation. Heavy dissaving by the government by far exceeded the modest private savings. The main correcting factor was net current external transfers to the government, followed by net investment income, while wage remittances and private current transfers added about 28% of financial needs. Net borrowing was only 16.5% of needs, representing 3.5% of GDP. In the comparative period external transfers to the government fell to less than one-half their relative importance, and income from investment was less than one percent of needs (falling even in absolute value). Gross national savings lost about 6 points to raise net borrowing needs to 22.2% of investment. The combination of expected falls in remittances, external transfers and income from external investments would make it difficult to sustain high investment rates without resort to quite heavy external borrowing.

To sum up, the performance of the Jordanian economy was found to exhibit certain characteristics which deserve special attention in both the model-building and the scenario exercises:

* The economy is heavily dominated by external factors which gained rather than weakened in importance over time.
* At the initial period this left the economy in a state of stagnation, which was then followed by rapid changes requiring continuous adjustments.
* The adjustments went far away towards increasing exposure to external factors. By the time these were pushing the economy ahead, they started to take reverse. Their gained power is adding to the adverse effects of this reversal.
* Instead of benefiting from the "good days" to put aside something for the future, the country went heavily into the red. This will delimit its capabilities in the future.
* One of the striking observations is the combination of heavy migration both ways, relatively high female participation rates and rather low overall participation rates. The employment question deserves some attention, both from the statistical and the policy points of view.
* There is a will to take up the cause of regional integration seriously. But this is not equally so with other partners. Anyhow, the question arises as to how to turn regional integration into a drive for development rather than simply sharing illfates. This gives material for further thought, falling outside the scope of the present study.
* In spite of the persistence of national accounting efforts and undertaking some statistical surveys every now and then (e.g., for the industrial sector and empolyment) there is a clear shortage of information on a number of important variables. The most serious shortcoming is the absence of sectorial investment figures. This puts a limitation on the possibility of bringing the model closer to planning needs.
* There exist in the literature some econometric models for Jordan, but they suffer from tailoring to data avilabilities, and to specific needs of authors. The planning ministry made an effort (see footnote p.2), but ended with an aggregative accounting model suitable for checking the consistency of aggregates of the 1986-1990 plan. We shall refer to some of these models when need arises.

II DATA PREPARATION

The basic set of data utilized is that of national accounts both at current and constant prices. There does exist a series for the East Bank starting from 1967. Before that data related to both banks and remained to do so until 1973, thus providing an overlap for the years 1967-1973.The Statistical Agency produces annually a publication on "National Accounts in Jordan", usually covering the preceding five years. Each volume updates previous years' estimates and adds preliminary estimates for the latest year. Publication is prompt; in fact early in 1987 there became available a publication going up to 1986. A summary of the series is published also in the Statistical Yearbook. We had to keep track of the continuous updating of information, especially for the earlier years for which not all issues of the NA series were available to us. Further, in 1977 the SNA was modified and the Statistical Agency shifted to the new system. Fortunately we could obtain during a visit to it a copy of a special issue which re-estimated the whole series over the period 1952-1976 on the basis of the new system. The estimates covered both banks for 1952-1966, and the East Bank only 1967 onwards. The Agency supplied us also with summary tables (mimeographed) for the main national accounting aggregates over the period 1952-1985,prepared in connection with the formulation of the new plan. This helped in checking on the continuity of estimates obtained from previous issues, at least up to 1980. More recent years were checked against more recent issues of the NA series.

On the other hand, the Central Bank reproduces a summary of the information in its "Monthly Statistical Bulletin". The Bank also published recently a special issue of its "Yearly Statistical Series" for the period 1964-1983, in commemoration of the twentieth anniversary of its establishment. This issue covered the main national accounting aggregates and helped to cover gaps in the updating of information obtained from a number of issues of national accounts documents. Further, the Bank also attempts to compile data on GDP in constant prices, and the latest base year used is 1975. For some time we relied on its issue Vol.22 No.11, relating to November 1986. Later on we had access to the more resent issue, Volume 23, No. 2, of February 1987, which carried up the series in constant prices up to 1985 whereas they stoped before at 1983. The Bank's publication gives also indices of unit value and unit volume for exports and imports by major SITC groups with 1969 as base (which is too far back). Starting January 1987 it shifted the base year to 1980. Indices for groups for preceding years were not recalculated; they were simply prorated.

Information on final consumption is relatively detailed. The NA series gives an annual breakdown of domestic expenditure (household and tourists) by commodity groups. For cost of living, indices exist from 1967 onwards. The base year was continuously updated, from 1967 to 1975, and finally to 1980. Indices for individual groups for preceding years were prorated, but weights

were updated in each case. Annual estiamtes of GFCF breakdown by type of assets are given in current prices. Apart from allocation of GFCF to private and public sectors, there exist no estimates of investment by production sector.(*) Further, there was no estimate of the capital stock, either by sector or overall. This is also coupled with absence of esimates of secorial capital coefficients, even in plan documents; the latest not excepted.

Lately the 1986-1990 Plan document gave data for some of the aggregates in terms of 1980 prices for the period 1980-1985, and for foreign trade aggregates only in current prices; while 1985 was estimated also in current prices. Thus the document failed to provide complete sets of estimates in either current or constant prices. Besides, it utilized data which were still preliminary for 1983-1985, and were modified in more recent NA publications. We had to rely on those data for some time which caused some trouble especially as we decided to re-estimate series in 1985 prices. This prompted resort to more updated data as they became available, which meant a revision of the whole set of estimates, both in current and constant prices.

Other sources were also investigated, the most important of which are publications of the IMF and the IBRD. The IMF estimates (published in the IFS) are usually those of the country itself.In cases where the base year is shifted (usually every five years), the previous price indices and estimates in constant prices were simply prorated in their totalities without any attempt to reconsider even broad components, which is quite misleading. On the other hand, the World Bank estimates, especially in country papers, included some effort to brush up data in the light of related information. One source that proved of some help was the series of the IBRD's "World Tables". The first issue of this series (that of 1976) gave estimates of GNP and final expenditures in constant (1969) prices for both Banks up to 1973. The latest (third) issue gave similar estimates, as well as estimates for value added by broad sector for the period 1971-1980, with 1975 as base.

We made it our first job to try to build up a coherent set of estimates both at current and constant prices. We chose to use 1985 as a base, although it comes at the end of the series. This was decided with a view to relate everything to the year which is considered as a base for current planning activities. For this purpose various price indices were re-estimated with 1985 as base: cost of living, foreign trade, GNP, value added by sector, and final expenditure, using the maximum detail that the publications permit. The Central Bank's estimates in constant 1975 prices for the years 1975-1985 were considered as a starting point. For the same and previous years, particularly for the late

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(*) cf., e.g., W.M.Mikhail :"A Standard Aggregative Model for the Jordanian Economy". Int.J.Middle East Stud.17 (1985),pp.67-88 Cambridge University Press, especially p.67. Dr. Mikhail was then a UN consultant to the Jordanian Ministry of Planning.

sixties, IBRD estimates were consulted, and in cases where data refered to both Banks, their relation to the East Bank data was used to obtain estimates for this latter. The same procedure was also applied to the year 1966, when lagged values of some variables were needed. Further, reference was made to the ENI-OAPEC estimates in connection with their joint study : "The Interdependence Project"(*) which gave estimates for the period 1968-1982 at 1980 prices.

Financial and monetary variables are needed to complement the picture. National accounts treat fiscal variables differently from fiscal accounts. We have tried to tie up the two sets together by starting from the government revenue data and use the "other indirect taxes" item to match them up. This enabled us to include government revenue in its fiscal definition, which proved useful in some government behavioural equations. This will also enable planners to include fiscal targets (in current as well as constant prices) in their plan formulation. But the monetary part proved more tricky. There do exist some studies which attempted formulating models for the monetary sector, and tying it to the physical one.(**) But the expansion in this direction required more price-formation possibilities than the data could warrant, as will be indicated in the next paragraph. One series, however, proved of importance to our exercise, namely that of commercial banks' **credit to the business sector.** This series was taken in its stock sense, which relates to credit outstanding at the end of each year. We calculated averages of beginning-of-year and end-of-year values to approximate the level for the (middle of the) year. These averages were deflated by the GDP at factor cost deflator to obtain their estimates in constant prices. This series proved useful in many cases.

The exercise of building up deflators and deflated series, even in cases where information was available, has to be taken with reservation. Generally speaking constant-price estimates published by the Central Bank and quoted by other sources are based on cost-of-living indices. Since these represent market (retail) prices for total supply of goods and services, they are overwhelmed by prices of imported goods and by market relationships which yield them unsatisfactory for estimating domestic value added in constant prices. Some attempt has been made to check these series and to examine the consistency of estimates made from the production side and those made from the expenditure side, using sources and uses balances. This also helped to avoid statistical discrepancy items often figuring out in constant price series estimated from both sides independently. Such discrepencacies are always a nuisance to model-builders. The same

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(*) ENI-OAPEC; The Arab National Macroeconomic Models 10d:Jordan" Interdependence Project. Kuwait, 1985.

(**)e.g., Adeeb Khalil Haddad: An Econometric Monetary Model of the Jordanian Economy. Ph.D. thesis, Colombia State University, Graduate Colleege, 1979.

remarks apply, even more strongly, for other variables for which we attempted building up separate deflators, although they helped to close up identities of sources-uses checks. One major difficulty was encountered as a result of this situation. It was difficult to introduce price equations, although price effects proved to be significant in some cases as will be seen later. We had to remain satisfied with the treatment of deflators either as exogenous or as satisfying evident definitional relationships.The final balancing items, such as savings, have still to be considered as including statistical discrepancies. This led to distortions of some observation points, but the series generally exhibited acceptable trends. We consider that the outcome is suitable for our purposes, though further investigation is warranted.

Estimation errors are not limited to series in constant prices. Reliability of different components of the national accounts differs according to availability of statistical sources and some variables serve as catch-all-errors when they are estimated as residuals of national-accounting identities. It will be seen later that, e.g., net lensing variables, suffered from this phenomenon. This makes it difficult to apply estimation methods treating observation errors by means of considering some series within the same set of accounts as instrumental variables. There is **no assurance that their observation errors are independent** of those of variables for which estimates are made. The same would apply for other simultaneous-equation techniques which boil down to introducing some (predetermined) variables as instrumental. Such techniques may be more accessible in rather limited models, but not to our case where the model attempts at covering all aspects of the economy.

Observation errors may be also **autocorrelated.** In some cases statistical estimates are obtained through interpolating or extrapolating information obtained for scattered points of time, e.g., population censuses, or industrial surveys. In some cases such infomation suffers also from incomplete coverage. One case is worth mentioning here. For the few observation points for which surveys exist, employment figures by sector are missing or misleading. Interpolated data published in some sources do not tally, and the process of interpolation itself introduces systematic statistical errors. We have also attempted to extend the process of interpolation in order to ensure the continuity of the sectorial employment estimates and their conformity to overall employment figures. As shall be seen later, this warranted the introduction of dummy variables for some consecutive years, as an expression of the bias arising from the process of interpolation, though the relevant periods differed from one case to another.

One other grave issue is that the country lives the **Middle-East problems** throughout. Apart from direct major events, such as the 1967 and 1973 Arab-Israeli wars, there had been some positive, as well as negative effects of the open-ended wars in Lebanon and the Gulf. This meant that some breaks may have been involved, and that external factors played an important role in the behaviour of the economy.

The **period covered** by our estimates starts at 1967, and this is for two reasons. First, in 1967 the country was subject to an Israeli aggression which chopped it into two parts.Since then the independent area is confined to the East bank. Second and accordingly, statistical data published since that date relate to the East Bank only. One may observe however that interference with data arises from this state of affairs. For example, external transactions cannot be always attributed to either Bank. Estimates of the balance of payments deal with this aspect within the errors-and-ommissions component. However, this component is totally included by the Statistical Agency in the estimation of the capital account of the private sector, which calls for scrutiny of estimates of other components and of the underlying statistical aggregates.

It is worth mentioning here that the information includes a number of **input-output tables** for the country. For example, the Statistical Agency produced tables as far back as 1968 (and that relates to both Banks). A more recent study was made in 1979 by a consultative firm - Dar Al-Handassa - on the basis of a detailed industrial survey. More recently, a UN consultant - Dr. William Mikhail - produced another table for 1983 on the basis of that work, using mostly office techniques.(*) He has also given estimates for coefficients in terms of 1985 prices, calculated on the basis of the 1983 coefficients but allowing for some preliminary price indicators for 1985 in relation to 1983. We have experimented with those coefficients for 1985, in an attempt to obtain sectorial production functions, thus bridging the gaps in national accounts data. But the trial met with two difficulties:

* First, the assumption of complete complementarity between domestic production and imports neither fitted the data nor did it suit the purpose.
* Second, the actual price changes produced a somewhat different picture from that displayed by the given set of coefficients.

Accordingly, we decided to update the table for 1985, using data available on national accounts and forign trade. The attempt is only tentative and is included essentially for illustrative purposes. We used a more concise table to avoid superfulous higher degree of detail not backed by sufficient factual information. Manufacturing industry was represented by seven rather than 24 sectors; electricity and water by one, and health and education sector was included with other services, which used to be a catch-all sector bearing the burden of balancing the table. This brought down the total number of sectors from 35 to 16. Data on intermediate consumption were based on those published in the national accounts, while the allocation of exports and imports to the new sectors was based on an investigation of the information given in the 1985 issue of the Statistical Yearbook. The 1983 table was cast in terms of 1985 prices using the indices given by Dr. Mikhail, then reduced to the 16 sectors in order to have a

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(*) William Mikhail:"An Updated Input-Output Table for the Jordanian Economy", UNDTCD, Document No. JOR/84/002. Amman, August 1986.

preliminary set of estimates of the coefficients in terms of domestic production rather than total domestic supply. An iterative method similar to that adopted by that author was applied. For this purpose a routine was developed on the basis of the package "Lotus 123", refered to before. A few rounds could in fact bring the table in order. Throughout the process our key variables were the 1985 data for domestic production, value added, exports and imports by sector. Other control figures were values of the totals of final demand components.Since the change-in-stocks estimates were not available on a sectorial basis, they might have led to some errors in other parts of the table.

However, we found it too risky to base our model on a double-shakey basis, the 1983 table and the 1985 table derived from it. In the absence of such information as indirect taxes per sector (essentially the manufacturing industries) and other relevant data,there was always the danger of carrying forth the base-year-estimates-errors to the future. On the other hand, even if we accept input-output production functions, we still lack the means to construct investment functions. The most familiar type of input-output models is demand-based. We have still to build up tools for estimating final demand and its sectorial breakdown. We eventually decided to take a short-cut by building up sectorial equations which express value added as a function of relevant types of final demand using historical (national Accounting) data rather than cross-sectional (input-output) data. This leads to a sacrifice of the sectorial detail, even when compared with the abridged table. The input-output table may be used as a subsidiary to check some results, or to obtain more details.

Thus we had to fall back to an overall production function, which prompted esimation of both capital stock and employment. We may say a few words here about the series of the capital stock. Having obtained estimates in constant prices, we built up a series of net investment in 1985 prices. We then centred two five-year averages of GDP, one in 1969 for the first five years of the series, and the other in 1983 for the last five years. We then calculated the increment in GDP between the two points on the basis of those averages. We added up net investments for the years 1968-1982, and assumed a lag of one year between investment and output. This gave us an estimate of a capital/output ratio, which was applied to the central year, 1976. Again we used a centred five-year GDP average for that year to estimate its initial capital stock. By means of the net investment series, we computed the series of capital stock backwards, and forward. The average for the whole period gives a capital coefficient of 4.8 which does not look unacceptable. However, as mentioned before, the coefficient was larger in the first part of the period, reaching its highest in 1973 when it amounted to 5.12. It reached a minimum of 4.0 in 1980 and started to rise again with the slackening in economic activity (due to external factors as observed before) to become 4.7 in 1985. In fact these values draw our attention to the pattern of growth reflected by the GDP series itself. It is evident that the country had been deeply affected by the two Middle-East wars, and other related events.

The 1967 war greatly depressed the econmy in 1967, and conditions slackened until the early seventies, with some retardation in 1970 due to the internal conflicts during that year in Jordan.The October 1973 war again affected the economy for the two years, 1973 and 1974. After that the oil-boom, accompanied by the beginnings of the Lebanese Civil War, uplifted the economy up to the early eighties. From there onwards the Gulf War then the recent oil recession took the lead. Such extraneous non-economic factors would certainly overshadow the straightforward statistical estimation process. They, and errors in data compilation (which sometimes turn to be systematic) warrant the introduction of dummy variables, for the time points and periods mentioned, or with some lag.

The series for **employment** raised some difficulties. As mentioned before the whole labour force and employment scenary raises a lot of questions. Participation rates are published in a number of sources, e.g, the IBRD World Tables, Country Reports, and Development Reports, as well as the recent plan document. Series for sectorial employment are published e.g., in ESCWA's Statistical Yearbooks. Field data exist for some years as a result of household and labour surveys, namely for 1972, 1975 and 1979, the latter being a population census. They may be considered as base for intervening years estimates, in conjunction with data from other types of surveys, (e.g.,the various industrial surveys for establishments engaging 5 persons or more). Out of these bits and pieces some estimates could be built up, observing consistency. During the process we had to adjust total labour force and rates of participation, with reference to the bench-mark data,including the plan estimates for 1985. Rates of unemployment mentioned in the plan document for those bench-mark years were interpolated leading to annual employment estimates. These estimates were used to adjust available series of sectorial employment, by means of prorating. Account has to be taken also of the available estimates of Jordanians abroad and of expatriates in Jordan.

One other series is worth mentioning, namely the one for the **level of activity in the Gulf** area. Since many variables seemed to depend on conditions in Gulf countries including Iraq, we have built up series for GDP, exports and imports in the six GCC countries, and for them and Iraq. For some countries data were not available in the earlier years, and we carried back their series using those for other Gulf countries. Data for Iraq are extended for 1985 on the basis of the information given in the "Joint Arab Economic Report", published by the Arab League and Arab Funds and Agencies. The estimates are expressed in terms of SDR's. This unit was prefered to dollars since it gives a closer representation of the bases for exchange systems of most countries involved, and the expression of their command on goods and services in the world market, since its composition reflects the structure of their partners in trade. It has the further advantage of being the base for the rate of exchange of the Jordanian Dinar. It is intersting to notice, however, that the use of series in terms of dollars gave closer fits for cases where such series were relevant. Further, the inclusion of Iraq improved the

results in those cases. Similar remarks apply to cases where this series had to be used in constant rather than in current terms.

Gulf GDP in constant prices deserves some discussion. It is known that the traditional deflation of oil-countries' GDP leads to low, or even negative growth rates during periods of high oil prices. But those are the years in which those countries do have larger commands on goods and services through the world market due to their larger nominal incomes. And this command is quite relevant in the case of those countries owing to the predominant role of both exports and imports in their economies. It was decided, therefore, to deflate GDP by the deflators of imports of those countries, thus applying the "capacity-to-import" concept. The results were rewarding. It is interesting to notice that GDP thus defined proved more useful than deflated imports themselves in cases which would justify using them.

Another extraneous series which was required for estimation of investment income from abroad was that of **interest yields**. We have deflated the credit income by an index of a relevant variable namely the interest rate on euro-dollars in the London market, which excelled other choices. The debtor side was deflated by the domestic rate of interest, which showed marginal changes during the period. It is interesting again to notice that the dollar value of this interest rate proved to be more useful than its value in terms of SDR's, in explaining the investment income variable.

This completes our exposé of the data used in building up the model. Let us now turn to problems of estimation.

III- THE SYSTEM OF EQUATIONS:-

The previous discussion indicates that the model to be elaborated is essentially a national budgeting model which is tailored within the available degree of detail that could be obtained from published national accounts. It serves in considering alternative scenarios at the initial planning stage, and later on helps to check on the consistency of the components of the more detailed plan. It can be also supplemented with input-output analysis using the table which we tried to build up, or some more refined table. It may be stated here that only selected accounts of the complete standard system are built up and published. Further neither the business sector is differentiated from other users sectors, nor is the household sector treated separately from the private sector. This puts a limitation as to what we can propose.

On the other hand, we have attempted to link together series in constant prices using different bases. While doing that we found out, as mentioned before, that some of the published series e.g., for foreign trade unit value and cost of living categories are not recalculated when the base is changed. A multiplication by a proportionality factor is simply used. To this we add the fact that appropriate deflators are genrally lacking. Therefore, the attempt to recast all series in constant prices to the 1985 base is only tentative. But we found out that equations for some variables have to be expressed in current prices, while others are better introduced in constant prices. Thus our attempt gave us the freedom to use the relevant series as each case warranted. However, this necessitated the introduction of price series, not merely as deflators, but also as an integral part of the system of equations. Again for the same reasons and for the fact that price-formation data are lacking, we had to consider price series either as exogenous, or satisfying definitional equations of variables in constant prices. This tripled the size of the model as compared with one built solely in terms of constant prices. It also means that in the planning stage, application of the model requires some assumptions as to the future behaviour of the prices of different categories. The assumption of constant prices is one possible solution and does not contradict the structure of the model.

This treatment of prices introduces nonlinearities in the model. Other nonlinearities are encountered in cases where ratio of one variable to another, such as relative prices or other relative variables, e.g.,income distribution defined as the ratio of compensation of employees to net domestic product at factor cost. Another source of nonlinearity is the introduction of logarithms of some variables. This has arisen with respect to the production function as will be demonstrated soon. It may be mentioned here that logarithms were tried in other cases, but outcomes did not confirm their relevance.

In this connection we may add few remarks concerning the **homscedasticity** property of disturbances. Over time the values of

practically all variables have risen from small magnitudes to quite large ones, especially in cases where current prices or price variables were used. The assumptions of constant disturbance variance means that the relative magnitude of disturbances falls down as time moves on. This brings about the unavoidable state where predictions of the values for the early points of time may deviate considerably in proportionate dimensions. This may be acceptable if we consider the estimates from a confidence-region rather than point-estimate point of view. But it still means that these deviations may be carried over for future points through lag effects, when we solve the model for the whole historical period. Two things have to be borne in mind here. First, any assumption of heteroscedasticty has to be based on theoretical grounds and dealt with accordingly. Second, there is no serious danger of prolongation of (relatively) large shifts from the earlier points onwards, if they actually fulfill the assumption of randomness, i.e., the absence of serial correlation. The point will be considered later when we discuss model validation problems. Logarithmic transformations, if theoretically warranted, may reduce the impact of large initial deviations. But occasions which justified their consideration did not substantiate a case for them.

Some variables were found to be wholly functions of predetermined variables, which was a help in the process of simultaneous solution of the model as will be shown later. In some cases **lagged values** proved relevant; but there was no indication of a lag beyond one year(*). On the other hand, it is of the nature of the economy that many basic aspects are in fact functions of outside factors. In a sense it was a blessing to find that a variable such as the Gulf GDP could solve many problems. Besides cases where it has clear causal effects, it seems to play the additional role of representing the general level of activity in the rest of the world, thus solving a difficult problem of data estimation. Our resort to a deflator based on import prices was found satisfactory. The variables truly exogenous to the whole system are the Gulf GDP and the euro-dollar interest rate. However, the list of **prdetermined** variables was greatly extended as a result of the large number of price variables treated as exogenous. As may be seen from table (3), besides the 44 dummy variables, a time trend variable, and 17 exogenous variables, there are 30 deflators or ratios pf such deflators considered as exogenous, bringing the total up to 92. Further, there are 4 lagged values of exogenous variables, as well as 23 lagged values of endogenous variables, which leaves us with 128 endogenous variables, some of which are deflators left for estimation within the model. This size of predetermined variables made it difficult to apply techniques such as the three-stage-least-squares method to estimate the parameters of the model. The number of predetermined variables in the system by far exceeded that of points of observation.

(*) Distributed lags which involve a long series of lags proved to be relevant in many cases. But they also are represented by a one-year lag in the regressor itself.

While this practically solved the **identification** problem for all equations - at least for the order conditions - it limited our choice in estimation techniques.(*)

In general, **the OLS method** has been adopted. This is due to three reasons. First, it is not affected by the largeness of the number of predetermined variables in the system. Second, the method is suitable for predictive purposes, which are key to our needs. Third, the method is convenient for undertaking a detailed examination of alternative formulations.In many cases, autocorrelation was observed, and this called for examination of its effects on parameter estimates. On the other hand, due to either irregular events or to statistical anomalies, certain points of observation have to be treated separately. Dummy variables have to be introduced with an eye on the meaningfulness of results. These values accounted not only for possible shifts in the equations, but also for large accidental observation errors in estimating the variables. For purposes of strict structural estimation in the future, the present exercise may indicate possibilities which should be, in the final analysis, governed by abiding to the substantive needs of more sophisticated techniques rather than merely observing formal rules.

In selecting **dummy variables** the following rules were generally adopted. First, possible points of break (e.g., 1967, 1970, 1973, 1975, 1980) were given special attention. The end part of the series (1984, 1985) was also granted a chance, on the basis of the fact that its statistical estimates are still provisional. Second, cases such as employment, where it was known beforehand that systematic errors existed over a number of consecutive years were treated accordingly. Third, judgement was based on the assessment of the bahaviour of the coefficient of determination and that of the Durbin-Watson ratio. If no further meaningful explanatory variables seem warranted, we start by introducing a dummy variable of values 1 and -1 for the points that exhibit the largest positive and negative deviations. If the fit still calls for further consideration, the same values or those of 0.5 (+ or -) were introduced for points that so required. The process has to be limited to the least number of points of time, which proved generally so except in the case of public investment income from abroad, whose explanation was found confined to past euro interest rate since no other meaningful variable was found statistically significant. In doing so we have to watch the behaviour of the coefficient estimates as well. It should be mentioned here that a single large deviation may affect the value of the Durbin-Watson coefficient considerably. The set of points for which values of the dummy variable are introduced is the minimum one that improves the values of the mentioned two statistics, and at the same time does not lead to dislocations in the estimates of the parameters. If such dislocations appear,the whole formulation

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(*) It is not clear how could Dr. Mikhail in his model refered to in p.16, could apply 3-SLS to 11 observation points using 12 predetermined variables.

of the equation has to be considered, since this will be taken to imply that the estimates are functions of stochastic rather than systematic elements of the variables. This method has helped us to overcome at the same time the difficult issue of estimation with serially correlated disturbances. But it has one clear pitfall; it is based on results of successive rounds of estimation which casts doubt on the degree of confidence usually based on á priori selection of variables. It should be mentioned here that the procedure was only adopted after a painstaking examination of alternative formulations of each equation, that sometimes amounted to several tens, and dropping them either from a theoretical point of view (e.g., unacceptable parameter estimates) or from a statistical estimation point of view. The practice of using both positive and negative values, and the introuction of values of 0.5 was one way out of the need to introduce more than one dummy variable in the same equation.

In his aforementioned study (footnote p. 16), Dr. Mikhail was conscious of the fact that developments at the end of the historical period were more relevant to the purpose of predicting further devlopments than those at its beginning. He introduced a geometric progression of weights whose end value was unity, to be applied to all variables in the model. Examination of predictions and of 3-SLS parameter estimates led him to settle on a weight of 0.985. This meant that values of the last year received a weight of 1; those of the preceding year 0.985, and the one before its square, 0.970, and so on, until the beginning of the series whose weight was 0.860. If these weights were applied to our data, 1967 would have received a weight of 0.773. This method has its implications for the disturbances, since it automatically involves the assump-tion that weights correct for heteroscedasticity; otherwise the method of estimation will be impaired. It is difficult to accept that this holds unequivocally for all equations. Further, it does not deal with cases where extraneous factors produced shifts in the equations, which still left a need for introducing dummy variables in some cases. On the other hand, if we apply the idea to all variables in their linear form, weights will automatically disappear if ratios or logarithms of variables are introduced. If the basic motive was to allow for decreasing reliability of observations for prior points, such an assumption could be accepted. But it is difficult to assume that a true "structure" of an economy keeps changing over such a short period in this continuous manner, and for all equations in the system. Therefore we decided against adopting this treatment.

Throughout, we shall use a **system of notation** of four places, the basis of which is explained in table (2), and its details are given in Table (4) in alphabetical order for easy reference. Table (3) gives the list according to the order of computation. This order will be explained in Part IV on Model Validation. We decided to maintain the numbering of variables used there to ease cross references.

The following sections will deal with equations of the system according to the five major components mentioned before, namely:

a) Domestic output: overall and sectorial;

b) Domestic expenditures;
c) The external sector;
d) Transfer transactions; and,
e) Labour force and employment.

III.a) DOMESTIC OUTPUT:-

The attempt to build up production functions, for the whole economy and by sector, faced data difficulties. Input-output data were not reliable enough to assist in building up sectorial functions. Even if we remain satisfied with the implications of input-output production functions, they are confined to secondary inputs, and more is needed to deal with the primary factors, beyond the distribution of value added. On the temporal side, data on total capital stocks, as well as sectorial capital stocks and even investments, or simply capital coefficients are lacking. Input-output tables contain a breakdown of gross capital formation, but this is from the supply side rather than the demand. There is need to extend the input-output table to a more comprehensive "interflow table", similar to that constructed by Ragnar Frisch in his "Cairo Channel Model" in the early sixties. But this would require extensive field work which can be only implemented by the Jordanian authorities. On the other hand, besides the limitations already observed regarding employment figures, there is no sectorial or overall series by profession.

A solution out of this problem was sought along the following lines:

* First, an aggregated production function was estimated. This imposed the need for constructing total capital and employment estimates.
* Second, demand-based equations for value added by sector are constructed. These represent analogies to input-output production-decision functions in response to final demand. But they have the merit of being based on time series and of their flexibility in introducing other factors as well.
* Since there are 9 major sectors, this involved 10 equations among which an identity exists.
* Agricultural value added presented an exception owing to its exposure to exogenous (climatic) factors. The attempt to replace it with a 3-years moving average using information on both 1966 and 1986 (which became available recently) proved useful in the case of employment but not in the equation for value added. Hence we decided to use the above-mentioned identity in estimating it.
* An explanation of total intermediate consumption was given in terms of GDP. This is a gross aggregation of the whole input-output matrix. The variable and its deflator were required in other parts of the model.
* Using this latter and GDP at market prices we obtained an estimate for total domestic production, which was also needed in other equations.

III.a-1) The Aggregate Production Function:-

For the purposes of estimating this function, we had to build up series for both capital stock and total employment as indicated in Part II. An attempt to include both variables in the equation indicated high multicollinearity which rendered the estimates of their coefficients unacceptable. A correlation of 0.97 exists between them, and if their (linear) relationship is corrected for a shift witnessed for the period 1973-1981, the correlation coefficient approaches unity. This situation is not unfamiliar in similar cases, and alternative solutions are suggested:

* In his model for Jordan, Dr. Mikhail droped one variable and maintained capital only in his (linear) equation, since he doubted the reliability of the employment series. In doing that he started from the GFCF estimates, and from the assumption that 1974 may be taken as a base being considered as close to a state of steady growth. He left a constant rate of depreciation to be estimated within the function itself. In fact he selected a value for it which maximized the coefficient of determination of the production function and the investment functions.This gives no assurance of a meaningful estimation of either the capital stock or the production function itself: Dr.Mikhail observed that his procedure produced a marginal capital/output ratio of 1.41 for the whole period of estimation, vi.z, 1968-1978. If either variable is to be selected, employment seems to give a better fit. This may prove useful in dealing with the employment problem, crucial to the Jordanian economy, but it deprives the model from the dynamic mechanism which sets the pace of development of the economy over time.
* An alternative approach is to introduce a priori restrictions on the coefficients of the two variables, taking into consideration the properties of the function selected for estimation. One way of doing this is to give the coefficients of the two variables preselected values in the light of theoretical considerations, and with reference to similar cases. Thus in his study of the YAR, Mr. Lucas assumed a value of 0.25 for the coefficient of Ln(capital) and another of 0.75 for Ln (labour), since these values are considered to be "commonly appropriate values" (*). He also asserted that other plausible values have not much effect on the result, which is a natural outcome of the strong collinearity between the two series.
* Another, and a more rigorous way of doing that is to introduce such restrictions in the shape of relative weights for the two variables turning them into one, thus reducing the issue of estimation to one single coefficient for their weighted sum. Thus Dr. Marzouk, in his study of the Sudanese economy took account of the properties of the Cobb-Douglas

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(*) Edward F.Lucas: Draft Macro-Economic Model for Jordan for Yemen Arab Republic. UN ECWA, Beirut, July 1980. (mimeographed). See p. 7.

function which he used to express the production function,

which assert that the (value of the) marginal productivity of each factor is proportionate to its share in GDP.(*) The available information on GDP and on factor shares is used to ensure that the values selected for relative coefficients of the two variables are pertinent to the economy under study. The estimate obtained for the weighted sum is then free from the restriction of constant returns to scale which is imposed in a treatment of the form suggested by Lucas.

Selecting an exponential form, i.e., a Cobb-Douglas function, we decided therefore to adopt this latter approach. The initial estimates gave a coefficient of 0.540 for labour, and 0.673 for capital, i.e., a sum of 1.213, indicating increasing returns to scale. This may be understood to express the observed shift in later years from infrastructure activities to other productive sectors, especially manufacturing industries. However, there were indications of strong autocorrelation of residuals. Introduction of a dummy variable to account for a shift observed over the period 1971-1979, raised labour's coefficient to 0.885, and brought that of capital down to 0.333, keeping the total at 1.218. This is an indication of two things:

* The high collinearity between the two variables; and
* The need for investigating other economic factors that affected the domestic output, and which may have been responsible for the observed shift.

As had been observed in Part I, there are indications that the rate of utilization of capital improved over time, bringing the function closer to its contours. Hence we have to look for a variable that expresses this fact. It was found that the level of bank credit to the business sector deflated by the GDP deflator is a plausible expression of this state, and its introduction proved its significance. But this brought down the sum of the two factor coefficients to 0.56, which is unacceptably low.(**) Further, the significance of the factor coefficients went down considerably. There seems to be more collineaity. Again the introduction of a trend to express the learning process, seemed to suffer from the effects of collinearity. Attempts to adjust GDP by means of the agricultural adjustment factor, and/or excluding government services, and the corresponding employment, did not improve the situation.

(*) M.S.Marzouk: "An Econometric Model of Sudan; Simulation Ecperiment of Growth Prospects". Journal of Development Economics, 1 (1975), pp.337-358, North Holland Publishing Comp. See pp.347-349. See also the discussion on this point with respect to the viability of the marginal productivity theory in M.M.El-Imam: A Production Function for Egyptian Agriculture". NPC., Cairo, Memo. No. 152, 26/1/1959. (in Arabic).

(**) It may be mentioned that Marzouk obtained coefficient estimates for Sudan of 0.328 and 0.154 for capital and labour, adding up to 0.482 only. This may be accepted in an economy dominated by the agricultural sector - though not necessarily Sudan - but it is difficult to accept it in our case.

To deal with the problem, we calculated the ratios of compensation of employees to GDP, and their average over the period of estimation, weighted by GDP at constant prices, we obtained a ratio of 0.465 for labour, hence another ratio of 0.535 for capital. But the coefficient of the weighted sum remained unacceptable, although the fit remained high. We had to assume a coefficient of unity, leaving the effects of scale to be expressed through other variables. It is remarkable that this led to a negative coefficient for trend. There remained need for a dummy variable for the end years, 1967 and 1985, which is acceptable in view of the exceptional conditions of 1967, and the preliminary nature of 1985 estimates. The function takes the form:

Ln(IRQN) = -1.7917 + 0.4650 Ln(IKEQ) + 0.5350 Ln(IKKN&) +

0.2721 Ln(IKCN) - 0.0258 EKTQ - 0.1106 DRQN (122)

with ACD = 0.9925, D-W Ratio = 2.0726

where, ACD stands for the adjusted coefficient of determination, and D-W for the Durbin-Watson ratio, and the number of the equation is that of the variable Ln(IRQN) in the order of computation (see Tables 3 & 6).

III.a-2) Value Added by Sector:-

The next set deals with the sectorial breakdown of GDP at factor cost. This involves 10 equations: 9 for the major sectors selected, and a tenth for the item on imputed bank charges for those sectors. As mentioned before, the main rule here is to express those variables as functions of final demand. However, each variable dictated the most suitable form for its explanation. Thus:

i) Value added in the **mining and quarrying sector** is clearly dominated by both phosphate and potash. The first is represented by the value of exports of phosphate at constant prices, while the latter, which became important in the eighties, is represented by the production of potash. The quarrying part is less significant, and is represented by the value added in the construction sector, but with a one-year lag:

SQVN = 0.7277 +0.4591 FMPN + 1.4937 IPPQ + 0.0485 SCVN& +

2.9574 DQVN (98)

with ACD = 0.9923, D-W Ratio = 2.0548

ii) For value added in **manufacturing industries**, final private consumption was the relevant item of final demand. This may be considered as a reflection of concentration on consumers industries. This left room for a trend variable, whose positive coefficient may be taken as an indication of increasing satisfaction of domestic demand through domestic production. With a dummy variable DBVN this gives:

SBVN = -5.0932 +.0822 HXCN + 3.7639 EKTQ + 14.7836 DBVN (201)

with ACD = 0.9915, D-W Ratio = 2.1327

iii) Value added for **electricity and water** proved to be better explained as a function of industrial production, but with a strong distributed lag effect. This may be considered as an expression of the fact that the production of this sector is essentially capacity determined. The equation is:

SEVN = -1.7646 + 0.0410 SBVN + 0.8770 SEVN& + 1.6711 DEVN (202)

with ACD = 0.9990, D-W Ratio = 1.9658

iv) **Construction** value added is expected to be a function mainly of investment. It was found that it is better explained by the construction component of capital formation. Again a distributed lag is distinct, but in this case it is much weaker than that for electricity:

SCVN = -2.6048 + 0.2711 IXEN + 0.3941 SCVN& + 8.9929 DCVN (203)

with ACD = 0.9969, D-W Ratio = 1.8903

v) The **transportation** sector was found to be a function of GDP at market prices. There is still room for demand factors through the exports of other services since transportation is the main producer, and its activities are governed by conditions in neighbouring countries. However, this variable appears with one-year lag. Other sources of variability calls for a dummy variable also:

SPVN = 9.8774 + 0.0667 IRTN + 0.1209 FMON& +11.9727 DPVN (204)

with ACD = 0.9953, D-W Ratio = 2.1305

Value added in this sector is also required in **current prices** using its deflator which is considered exogenous:

SPVR = SPVN * SPVP / 100 (208)

vi) For **trade** both GDP at market prices and imports of goods play a role. These are expressions of demands arising from both domestic and external activities. It is important to introduce the imports term since they outpassed domestic output in their growth rate as had been indicated before:

SDVN = 23.1905 + 0.1186 IRTN + 0.0352 IMGN -11.077 DDVN (205)

with ACD = 0.9942, D-W Ratio = 2.1406

vii) **Finance and real estate** are a function of household consumption, essentially through the real estate component. The other variable that exerted a significant influence is the credit variable mentioned in the production function. This variable is included in the exogenous list, and may be taken as an expression of the financial activities component:

SFVN = 37.5645 + 0.0417 HXCN + 0.0513 IKCN + 20.490 DFVN (206)

with ACD = 0.9830, D-W Ratio = 2.0443

viii) With financial services go **imputed bank charges.** Again they

were found to be a function of the bank credit variable, but the relevant value of financial services is one with a lag of one year:

SIVN = -1.1499 + 0.0093 IKCN + 0.8083 SIVN& + 2.7634 DIVN (100)

with ACD =0.9923, D-W Ratio = 2.1529

ix) The interpretation of services through total final consumption required introduction of a one-year lag. This still left room for a distributed lag effect, which may be taken as an indication of the persistence of the activities of the services sectors, especially government services:

SSVN = 35.0103 +0.0802 IXCN& + 0.4496 SSVN& +17.0261 DSVN (101)

with ACD = 0.9905, D-W Ratio = 1.9863

x) The agricultural sector could not be easily subjected to direct estimation, even when adjusted the way we suggested before. Hence we left it to be estimated through the identity tying up GDP and its components. This gives two definitional equations:

IRQN = Exp(IRQN$) (123)

SAVN = IRQN - (SBVN + SQVN + SEVN + SCVN + SPVN + SDVN + SFVN - SIVN + SSVN) (207)

III.a-3) Other related Equations:-

On the basis of the estimates of GDP at factor cost, a number of related variables may be estimated. These are:

i) GDP at current prices is required for other parts of the model. For this purpose we use the deflator which is considered exogenous:

IRQR = IRQN * IRQP / 100 (124)

ii) Net Domestic Product at Factor Cost is obtained through identities, using estimates of depreciation allowances to be given later:

IRPR = IRQR - IRDR (129)

IRPN = IRQN - IRDN (130)

These together yield an estimate of the deflator of this variable:

IRPP = IRPR / IRPN * 100 (131)

iii) Similarly Gross Domestic Product at Market Prices can be estimated using estimates of net indirect taxes at current and at constant prices given elsewhere:

IRTR = IRQR + GTNR (127)

IRTN = IRQN + GTNN (128)

These two equations may be used to obtain the deflator for this variable. However, since we do not need it, we shall not include it in the system.

iv) We may also estimate another variable required by the model namely **total intermediate consumption.** Alternative formulations which allowed for differences between groups of sectors, ended with one which expressed it as function of GDP at factor cost and a dummy variable only:

IXIN = -175.80 + 1.2212 IRQN + 225.873 DXIN (134)

with ACD = 0.9931, D-W Ratio = 2.0364

Assuming the deflator of this variable to be exogenous, we may calculate its value at current prices as:

IXIR = IXIN * IXIP / 100 (136)

v) The above equations enable us to estimate **total domestic production** at both constant and current prices. Again the deflator could be obtained if needed,which is not the case:

IPRN = IRTN + IXIN (135)

IPRR = IRTR + IXIR (137)

III.b) Domestic Demand:-

In this section we deal with items of final demand for both the private and public sectors, hence for the whole economy. We start by the consumption functions, followed by gross fixed capital formation, depreciation allowances, and change in stocks. In doing that we have to shift from the concepts of domestic product to those of disposable incomes. We shall define these latter in terms of transfers which are to be given in detail in section (III.d).

III.b-1) Final Consumption:-

i) **Household consumption** is found to be a function of three variables which need further investigation. The first is the private disposable income. The equations for this variable in constant and current prices, as well as its deflator are defined in terms of:

* Net domestic product at factor cost, IRP, which is attributed in national accounts to the private sector in the first stage of income distribution.
* Net domestic transfers between the private and government sectors. This involves transfers from the government,HGR, transfers to the government, GHR, as well as income taxes GTY.
* Net revenues from abroad, HRX, which in turn inculde net factor incomes, namely investment incomes and net workers remittances, and net transfers.

These internal and external transfer items will be discussed later on in section (III.d).

Thus:

HRYN = IRPN + HGRN - GHRN - GTYN + HRXN (149)

HRYR = IRPR + HGRR - GHRR - GTYR + HRXR (150)

HRYP = HRYR / HRYN * 100 (151)

Another variable which proved relevant to the household consumption function is income distribution measured as the ratio of wages (compensation of employees) to net domestic product at factor cost, both taken at current prices. This requires determination of the compensation of employees, which was found to be a function of net domestic product at factor cost and of the rate of change of its deflator (present - past values):

RRLP = IRLR / IRPR *100 (133)

where,

IRLR =-4.0534 + 0.5362 IRPR -3.6640 IRPP% +33.6721 DRLR (132)

with ACD =0.9991, D-W Ratio = 2.0377

It is interesting to notice that the marginal coefficient for compensation of employees is 0.536 which exceeds the average of 0.465 we obtained before as an average for the period. This may have been the cause for the observation inPart II of the tendency of compensation of employees to possess an increasing average share of NDP over time.

The third variable which is required for the household consumption function is the relative price of consumption which is considered exogenous,to the deflator of disposable income obtained above:

RXCY = HXCP / HRYP *100 (152)

Other versions of income gave unacceptably high values of the propensity to consume. There was no indication that the behaviour of consumers reflects habit persistence. This may be understandable in an economy exposed to continuous extraneous consumption drives from outside. There is also indications that the income distribution element plays a role;which is always a controversial problem in literature. In our case the share of wages in NDP proved to have significant effect with a one percent rise in this share leading to an increase of about 9 million JD in 1985 prices. Finally, in spite of the questionability of the price series of disposable income there seems to be a significant effect of the price of consumption related to the deflator of income.

Thus:

HXCN = 646.187 + 0.7595 HRYN + 8.9769 RRLP - 9.7423 RXCY -

122.00 DXCN (153)

with ACD = 0.9948, D-W Ratio = 1.8055

HXCR = HXCN * HXCP / 100 (154)

ii) **Public consumption** was found to be a function of the present value of government's domestic revenue and the change in external transfers, both taken in current prices. This expresses the fact that the government is motivated in determining its expenditures, during the budgeting process, by its domestic revenue;and at the same time it responds to changes in transfers from abroad. This calls for obtaining first the equations for **domestic revenue.** Its components, i.e., the various categories of taxes and other types of transfers from the private sector, as well as external transfers, will be discussed in section (III.d).

GRRR = GTER + GTMR + GTOR + GTYR + GHRR + GRDR (144)

The item on depreciation allowances, which is subtracted from other indirect taxes, GTOR, is treated as exogenous, and will be considered later on in this section. Thus the public consumption function is:

GXCR =34.5788 + 0.8365 GRRR + 0.2041 GRRR% +33.0012 DXCR (155)

with ACD = 0.9975, D-W Ratio = 2.1035

GXCN = GXCR / GXCP * 100 (156)

The estimate at constant prices, required for other parts of the system,is obtained through an exogenous deflator. It is interesting to notice that in spite of the fact that the average propensity to spend out of revenue is much greater than unity, the coefficient of domestic revenue is equal to 0.84. However, over time there was more reliance on external resources. This means that if these resources dwindle down, there will be need to cut down public consumption considerably; otherwise there will be need to resort to borrowing. This has to be further investigated in alternative scenarios.

We are now in a position to estimate **total final consumption expenditure**, and its deflator:

IXCN = HXCN + GXCN (158)

IXCR = HXCR + GXCR (159)

IXCP = IXCR / IXCN * 100 (160)

III.b-2) Capital Formation:-

In this section we deal with gross fixed capital formation, depreciation allowances,capital stock and change in stocks.

i) **Private gross fixed capital formation** in constant prices is found to be partly explained by financial resources as well as relative prices, and partly by the acceleration principle. For this purpose we had to estimate svaings out of disposable income, their deflator, and the ratio of the

GFCF deflator to it, and some approximation to what may be considered private output. Having estimated net disposable income and final household consumption, we need an estimate of the private depreciation allowances.This will be defined below. Hence we define **private gross savings** as:

HSGN = HRYN + HRDN - HXCN (162)

Given the values of these components in current prices we can obtain savings in current prices, hence their **deflator:**

HSGR = HRYR + HRDR - HXCR (163)

HSGP = HSGR / HSGN * 100 (164)

Assuming the GFCF deflator, IXGP, to be exogenous, then:

RXGG = IXGP / HSGP * 100 (165)

Since published national accounts do not differentiate **GDP due to the private sector**, we have to approximate it by subtracting some items which are known to belong to the public sector from total GDP. We adjust the balance for the deviation of agricultural output from its moving average. Hence:

IRAN = IRQN - SADN - SQVN - SEVN - SSVN (166)

This is only a rough approximation, in which we excluded the total of the mining, electricity and services sectors. This may involve marginal private activities, which are counterbalanced by public contribution to other sectors.The rate of change of this variable proved relevant to the **GFCF**

HXGN = 168.279 + 0.6012 HSGR - 1.2348 RXGG + 0.6713 IRAN% + 54.9676 DXGN (167)

with ACD = 0.9927, D-W Ratio = 2.2198

It is intersting to notice that the main factors affecting the investment behaviour of the private sector are finance-based rather than production-based. The financial component is represented by gross (national) savings in current prices, coupled with a variable representing relative prices. Response to expansion of future production requirements are significantly below unity, whereas the overall capital/output ratio is over 4. The value in current prices is needed only for equation (224) on private net lending, and it is included there as:

HXGR = HXGN * HXGP / 100

ii) **Public GFCF** is again better explained in current prices rather than constant prices, and is governed by budgetary considerations, with no indication of response to external transfers:

GXGR = -7.2286 + 0.6651 GRRR + 53.3047 DXGR (168)

with ACD = 0.9935, D-W Ratio = 2.0063

Together with the public consumption function, this gives a **propensity to spend** of 1.5. This is an indication of by how much the government "lives beyond its means" and hence its heavy reliance on external sources of finance, which increases rather than decreases with the rise in its revenue. At the same time domestic revenue is the main determinant of domestic expenditures, which involves the government in seeking external sources in the light of its domestic expenditure decisions. Using the overall deflator of GFCF we obtain the corresponding value in constant prices:

GXGN = GXGR / IXGP * 100 (169)

Hence, **total gross fixed capital formation** is:

IXGN = HXGN + GXGN (170)

IXGR = IXGN * IXGP / 100 (172)

There is a related variable which will be required later on in the system, namely, the **construction component of GFCF**, which is a function of GFCF itself, in current prices. Its value in constant prices, is obtained by means of its (exogenous) deflator:

IXER = 5.4634 + 0.5921 IXGR + 50.9937 DXER (173)

with ACD = 0.9974, D-W Ratio = 1.9112

IXEN = IXER / IXEP * 100 (174)

iii) To estimate the Capital stock we need first to seek an explanation for **total depreciation allowances** in constant prices. It is a function of beginning-of-year capital stock and the past value of depreciation allowances. To obtain its value in current prices, we use the exogenous deflator. Thus:

IRDN =-25.610 + 0.0150 IKKN& + 0.5044 IRDN& +9.0521 DRDN (103)

with ACD = 0.9946, D-W Ratio = 1.9900

IRDR = IRDN * IRDP / 100 (104)

Assuming public depreciation allowances to be exogenous, we define **private depreciation allowances** as:

HRDR = IRDR - GRDR (105)

HRDN = HRDR / IRDP * 100 (161)

Capital Stock, hence its logarithm introduced in the production function, can be readily defined as:

IKKN = IKKN& + IXGN - IRDN (171)

IKKN$ = Ln(IKKN&) (121)

iv) There remains the last component of investment,viz., **change in stocks**. The item for the public sector, GXHR, is treated as exogenous. The total of the variable at the domestic

level is taken as the difference between sources and uses, with the objective of using it for checking purposes in the prediction stage. Thus:

IXHN = IRTN + IMTN - IXCN - IXGN - FMTN (221)

IXHR = IRTR + IMTR - IXCR - IXGR - FMTR (222)

The value of private change in stocks is included in equation (224) on private net lending as the difference

HXHR = IXHR - GXHR

III.c) The External Sector:-

In this section we deal with exports and imports of goods and services. The general breakdown in both cases is:

* Goods include: Consumers goods, Intermediate goods (together with miscellaneous and unclassified items) and capital goods. Certain items may be segregated for specific purposes; e.g., exports of phosphate, or imports of fuel. Total exports of goods, hence the overall total, include re-exports.
* Services include travel services and other services.

III.c-1) Exports of Goods and Services:-

The treatment of exports raises two types of problems. The first relates to the appropriate categories to be considered; and the second concerns obtaining the necessary information on external factors determining demand for them. If such information exists, it will still be difficult to obtain reliable estimates for categories determined by the end-use. Estimates based on producing sector would be essentially determined by domestic production, while external demand variables will appear only in so far as domestic goods have a special position in the world markets. Since most Jordanian exports (possibly with the exception of phosphate and certain services) play a minor role in world markets, they are expected to be determined by domestic capcities more than by levels of demand in the rest of the world. Again re-exports raise their own specific problems, being related to imports and to conditions in the neighbouring countries. Experimentation with alternative formulations led us to settle on the following line of analysis:

* We consider exports of phosphate as exogenous. They may be regarded as a function of the production of phosphate; but we have then to consider that production as exogenous, along the lines followed by the ENI group.(*) This raises a problem of the direction of causation.
* We then seek an explanation of total exports (including re-exports) except those of phosphates.
* A function is constructed for total services exports. This

(*) ENI-OAPEC: op.cit.. See footnote p.17.

leaves exports of goods for an identity.

* Again, since exports of other (than travel) services are needed, we fit a separate equation for them. This gives the possibility of obtaining travel services as a residual.

i) **Total non-phosphate exports** in constant prices are found to be a function of three variables. The first is gross domestic product at market prices. Table (7) shows that the value of these exports increased about tenfolds between the two summary periods of Table(1); which brought them up from 11.6% of GDP at constant prices to 46.4%. This implies a (gross) marginal rate of 0.71%. Inclusion of other variables in the equation led to a coefficient representing a net marginal rate which is about 67% of that gross coefficient. The second variable represents the effect of external demand, measured by GDP of the Gulf countries (and Iraq) deflated by their imports deflator. The third variable is the adjustment factor of agricultural value added, on the account that exports of agricultural products are affected by unexpected changes in agricultural production. However, this variable exhibited a one-year lag. This formulation exhibits the fact that since Jordan's exports are minor in world markets, their size is determined by domestic capacities in the first place.

FMUN = -226.05 + 0.4758 IRTN + 0.8589 EGTN + 0.8585 SADN& +
32.2565 DMUN (175)

with ACD = 0.9944, D-W Ratio = 1.9706

This leads to further estimates. Given the exogenous values of phosphate exports at constant prices, and their deflator as well as that of total exports, we can derive their values at current prices. We can also define total exports at current and constant prices:

FMPR = FMPN * FMPP / 100 (93)

FMTN = FMUN + FMPN (177)

FMUR = FMUN * FMUP / 100 (178)

FMTR = FMUR + FMPR (182)

ii) The explanation of **exports of services** follows the same pattern, except for the agricultural adjustment item:

FMSN =-146.90 + 0.2247 IRTN + 1.1751 EGTN +39.4832 DFMS (176)

with ACD = 0.9957, D-W Ratio = 2.0326

FMSR = FMSN * FMSP / 100 (179)

It is interesting to notice that whereas the coefficient of GDP is less than half that for total exports, that of the Gulf GDP exceeds that for the latter.

iii) However, the attempt to explain the component **other services** raised some difficulties. First, it is better explicable in current rather than constant prices. Second,it was

expected to be subject to some effect for the Gulf level of activity, since it includes transportation services known to be affected by that levl. This did not prove to be so. In fact experimentation with alternatives showed that travel services are the part that is so affected. GDP at market prices gave a good fit for other services:

FMOR = -32.065 + 0.1960 IRTR + 19.8527 DMOR (180)

with ACD = 0.9965, D-W Ratio = 2.2973

FMON = FMOR / FMOP * 100 (181)

III.c-2) Imports of Goods and Services:-

Imports could be handled according to categories by end use. For this purpose, the estimates of unit value indices published by SITC groups were utilized to obtain deflators and deflated values by selected groups. The import functions obtained were as follows.

i) The first category of goods is **imports of consumers goods.** These were found to be a function of three variables. The first is household consumption, while the second exhibits the readiness of the Jordanian consumers to expand their demand on foreign goods whenever they obtain financial means that go beyond their regular incomes. For this purpose we used a variable which covers external receipts which are essentially of a transfer nature, namely the sum of net workers remittances and current transfers from abroad. The third factor indicates a price effect, since it measures the (exogenous) consumers goods imports prices relative to the (also exogenous) index of conumers prices:

RMCC = IMCP / HXCP * 100 (95)

Hence,

IMCN = 73.6771 + 0.1839 HXCN + 0.2913 HRGN - 0.6064 RMCC + 13.5614 DMCN (183)

with ACD = 0.9946, D-W Ratio = 1.9026

ii) We have included with **imports of intermediate goods, miscellaneous goods** also, since they were not yielding to separate treatment. However, this has affected the equation in the sense that the dummy variable had to cover a wider scope than usual. The level of domestic activity was best represented by the variable for domestic production. But this was not enough, and we had to introduce the change in the level of bank credit (in constant prices also) as an indication of the effect of this credit on the possibility of importing more intermediate goods at the same level of production. A trend term reflected the already noticed fact that as time went on, the Jordanian economy showed more reliance on foreign inputs. Again a price response was discernible, and was measured in terms of the ratio of the (exogenous) deflator of this catgory of imports to the (also exogenous) deflator of intermediate consumption:

RMHI = IMHP / IXIP * 100 (97)

Hence,

IMHN = 179.577 + 0.0917 IPRN - 2.3747 RMHI + 0.3818 IKCN% +

10.4804 EKTQ + 24.4739 DMHN (184)

with ACD = 0.9965, D-W Ratio = 2.3328

iii) For imports of **capital goods** we had to use a variable suggested by the ENI report, namely the rate of capital formation measured by the ratio of total GFCF to GDP at market prices, both in constant prices:

RXGT = IXGN / IRTN * 100 (185)

The other variable that proved of relevance was the availability of external resources to the private sector, as defined above, but in this case with a one-year lag, which reflects both the effects of extra finances, and the time needed to respond to them, which is longer than that in the case of importing consumers goods:

IMKN =-104.49 + 7.7762 RXGT + 0.3756 HRGN& +39.2679 DMKN (186)

with ACD = 0.9924, D-W Ratio = 1.9319

iv) **Imports of services** were treated together without any further breakdown. They were found to depend on total final consumption, current and past. Here public consumption plays a role since a good deal of these services are demanded by the government also. The financial resource element in this case is total external receipts. Again there is a relative price effect measured through the ratio of the (exogenous) deflator of imports of services to the (endogenous) deflator of total consumption:

RMSC = IMSP / IXCP * 100 (195)

Hence:

IMSN = 119.246 + 0.2205 IXCN + 0.2362 IXCN% + 0.2677 IRXN -

2.9394 RMSC + 61.7302 DMSN (197)

with ACD = 0.9974, D-W Ratio = 2.1473

v) The above estimates yield another set of **totals** and of **values at current prices:**

IMGN = IMCN + IMHN + IMKN (187)

IMTN = IMGN + IMSN (199)
IMCR = IMCN * IMCP / 100 (190)
IMHR = IMHN * IMHP / 100 (191)
IMKR = IMKN * IMKP / 100 (192)
IMSR = IMSN * IMSP / 100 (198)
IMGR = IMCR + IMHR + IMKR (193)
IMGP = IMGR / IMGN *100 (194)
IMTR = IMGR + IMSR (200)

III.d) Transfer Transactions:-

We now turn to the process of income redistribution through the budget, and to transfer of resources between the economy and the rest of the world aside from the export-import relationships discussed above. We shall start with the government sector whose decisions affect the share that remains at the disposal of the private sector out of the domestic income. This will be followed by discussion of external transactions.

III.d-1) Indirect Taxes and Subsidies:-

Indirect taxes are broken down into components, on which information exists in fiscal data and national accounts. The latter also gives separate deflators for each of them, as may be found in the series published by the Central Bank (from 1975 onwards). To tie up the two sets of data, we have djusted the data on "other indirect taxes" so as to take account of imputed depreciation allowances, and to fit at the same time the total of different sources of government revenue with the total of domestic revenue of the government. At the same time the series on subsidies fits with both the expenditure data in the fiscal system and the national accounts data on net indirect taxes.

i) The first item is **excise duties**, which are found to be a function of past value of domestic production, and a distributed lag:

GTER = 0.9688 + 0.0086 IPRR& + 0.5146 GTER& -4.4741 DTER (106)

with ACD = 0.9906, D-W Ratio = 1.9124

The lags may be due to the fact that data relate to actual receipts rather than to accruals.

ii) The second item is **customs duties**, which are a function of imports of goods,and a distributed lag also. This is one of two cases in the whole system that came out void of dummy variables:

GTMR = -15.457 + 0.0703 IMGN + 0.4745 GTMR& (188)

with ACD = 0.9949, D-W Ratio = 1.9577

This formulation subdues the role of ad valorem duties, since imports appear in quantum rather than in value, and no price effect was discernible. Such an effect semm to be shifted to other indirect taxes, i.e., the following item.

iii) The third item is **other indirect taxes** which are taken net of imputed depreciation allowances. They are a function of the value added of the transportation sector in current prices, since they include taxes on that sector. They are also a function of the change in the GDP at factor cost deflator, and of the deflator of imports of goods, as expressions of the domestic and external components of these taxes:

GTOR = - 23.421 + 0.1626 SPVR - 1.2181 IRQP% + 1.1824 IMGP -

13.250 DTOR (209)

with ACD = 0.9916, D-W Ratio = 1.9636

The negative effect of the GDP deflator may be taken as an indication of one or both of two possibilities.The first is that these taxes have a base related to volume rather than current values. The second is that exemptions may take place as costs go up. This latter case would require, strictly speaking, use of costs related to earnings. In a sense, and by the definition of price indices, this is indirectly expressed by using the rate of change rather than the absolute level of the deflator of GDP at factor cost. This will be close to the desirable expression if the rise in earnings follows with some longer lag the change in costs.

iv) On the negative side is **subsidies.** Since subsidies were directed for some time to alleviate the impact of rapidly rising fuel costs as a result of the jump in international prices of (imported) oil, the function includes this factor in the form of the ratio of the (exogenous) price of fuel imports to the deflator of intermediate consumption:

RMFI = IMFP / IXIP * 100 (96)

By the same token, subsidies are assumed to increase with the rise in the cost of intermediate consumption, measured by the change in its deflator. A distributed lag is still warranted. Hence

GTSR = -17.401 + 0.5275 RMFI + 0.4592 IXIP% + 0.4104 GTSR& +

38.7189 DTSR (108)

with ACD = 0.9864, D-W Ratio = 2.1321

Here again the change in IXIP plays a role similar to that of IRQP% in other indirect taxes mentioned above. The positive sign is obvious since subsidies are negative taxes.

v) This enables us to define **indirect taxes net of subsidies,** reuired for estimating GDP at market prices given its value at factor cost.

GTNR = GTER + GTMR + GTOR - GTSR (125)

vi) The above items may be transformed into **constant prices** by means of specific deflators, all of which are considered exogenous. This treatment is prefered to the alternative of assuming an exogenous deflator for GDP at market prices and obtaining their total by means of an identity.

GTEN = GTER / GTEP * 100 (107)

GTMN = GTMR / GTMP * 100 (189)

GTON = GTOR / GTOP * 100 (210)

GTSN = GTSR / GTSP * 100 (109)

GTNN = GTEN + GTMN + GTON - GTSN (126)

III.d-2) Direct Taxes and Transfers:-

Together with indirect taxes items,direct taxes and transfers from the private sector and depreciation allowances, add up, as had been shown in (III.b-1,ii), to government's domestic revenue. To estimate disposable income we need, besides subsidies, assistance payments and other transfers to the private sector.

i) **Income taxes** are found to be function of GDP at factor cost

GTYR = - 3.9471 + 0.0400 IRQR +4.1394 DTYR (138)

with ACD = 0.9992, D-W Ratio = 2.0323

It may be noticed that it is gross rather than net product that proved relevant. Further no income distribution effect seemed warranted.

ii) The **transfers from the private sector** include other direct taxes, pension contributions and fees. In this case GDP at market prices proved more relevant:

GHRR = 0.7202 + 0.0356 IRTR + 8.6110 DGHR (140)

with ACD = 0.9907, D-W Ratio = 1.8116

iii) On the other hand **transfers to the private sector** are essentially assistance payments and pensions. Here, besides the effect of GDP at market prices, we have another term reflecting the income distribution effect as measured by the ratio of compensation of employees to NDP. Thus:

HGRR =-106.96 + 0.1230 IRTR + 2.0540 RRLP +17.1860 DHGR (142)

with ACD = 0.9906, D-W Ratio = 2.0081

iv) We are now in a position to estimate government's **net domestic disposable income:**

GRZR = GRRR - GTSR - HGRR - GRDR (145)

This consludes the redistribution process of NDP at market prices.

v) Again using exogenous deflators we can obtain values at **constant prices.**

GTYN = GTYR / GTYP * 100 (139)

GHRN = GHRR / GHRP * 100 (141)

HGRN = HGRR / HGRP * 100 (143)

III.d-3) External Incomes and Transfers:-

The items included in this section cover factor incomes and transfers from abroad. Besides net investment incomes, we have also net workers remittances,which are treated as another type of factor incomes from abroad. This would help estimating national income; but this variable did not prove relevant to the system.

Further there are net transfers from the rest of the world, which play an important role in the Jordanian economy, especially with regard to the government sector. In certain parts of the system we needed external resources flowing into the economy. In this respect we consider workers remittances as of the nature of transfers and define - for the private sector - a variable combining them with net transfers from abroad.

HRGN = HRWN + HRFN (117)

i) To start with we consider **net investment incomes** from abroad. For the **private sector** we consider this variable as exogenous. Assuming also the deflator of this item to be exogenous, we have its value in constant prices as a derived exogenous variable:

HRIN = HRIR / IRIP * 100 (94)

For the **public sector** the best fit we could get was a function of the past value of the euro dollar interest rate in the London market. The fit was not strong enough which called for a detailed dummy variable, which may be considered as an indication for the need for some economic variable. But none of the variables in the system proved of significance. Hence:

GRIR = -4.4923 + 1.6167 EURR& + 10.3506 DRIR (110)

with ACD = 0.9566, D-W Ratio = 2.0971

GRIN = GRIR / IRIP * 100 (111)

ii) The main source of external revenues of the private sector is **net workers remittances** which increased considerably since the mid-seventies as indicated before. As expected, these remittances are found to be dependent on the level of activity in the Arab oil-producing countries, namely the Gulf countries and Iraq. More interesting still is that the relationship indicates a lagged effect, which is legitimate since remittances come out of wage receipts some time earlier. That level is measured, as mentioned before, in billions of dollars, and its deflator was taken as the deflator of imports of the relevant countries. Since we have included the deflator and the value at constant prices of this variable among exogenous variables, its current value is considered among the derived exogenous variables:

EGTR = EGTN / EGTP * 100 (92)

Hence,

HRWR = - 8.8131 + 1.2376 EGTR& + 98.3770 DRWR (112)

with ACD = 0.9945, D-W Ratio = 1.8962

iii) For the **government sector, net transfers from abroad** prove to be the most important item in this set of transactions.

The main source - though not the only one - comes from the rich Arab countries, i.e., the Gulf Countries. Hence the Gulf GDP figures out in this relationship also. On the other hand, it is expected that the government seeks further assistance from this source in the light of its domestic disposable income. This variable is expected, therefore, to have a negative effect; the more disposable income is, the less the need for resources from abroad. It is intersting to notice that the coefficient of this variable indicates that as disposable income increases by one million Dinars, the transfers from abroad fall down by 0.9 million:

GRFR =41.5100 - 0.8962 GRZR + 1.4920 EGTR +67.4951 DRFR (146)

with ACD = 0.9867, D-W Ratio = 1.9354

Using the exogenous deflator of this variable,we obtain its value,hence the **total of public external receipts** in constant prices:

GRFN = GRFR / IRFP * 100 . (147)

GRXN = GRIN + GRFN (148)

iv) For the **private sector** such transfers are rather small and somewhat irregular; so are the net receipts from investment income from abroad. Hence we decided to consider the sum of all **external receipts**, and obtain components through identities.

HRXR = -5.9829 +1.2962 EGTR& + 67.9841 DRXR (114)

with ACD = 0.9961, D-W Ratio = 1.9662

Here again the main determinant is the Gulf GDP, and with the same lag witnessed for remittances. In fact, these latter leave only some extra 0.06 for the other items as may be seen from comparing the coefficients of EGTR& in the two equations.

v) Thus **private net transfers from abroad** can be estimated using the identity:

HRFR = HRXR - HRIR - HRWR (115)

Again with the deflators of both workers remittances and of net transfers from abroad taken as exogenous, we have:

HRWN = HRWR / HRWP * 100 (113)

HRFN = HRFR / IRFP * 100 (116)

HRXN = HRIN + HRGN (118)

where HRGN has been already defined in the introduction to the present section. The above variables lead also to **total foreign receipts at constant Prices:**

IRXN = HRXN + GRXN (196)

v) Having estimated incomes and expenditures, we define first the balances of the current accounts of the two sectors, viz their **gross savings.** This had been already defined for the private sector in section (III.b-2,i). For the **public sector** we have

GSGR = GRZR + GRDR + GRIR + GRFR - GXCR (157)

vi) Balances on the capital account, namely **net lending** can be also obtained as follows:

GXLR = GSGR - GXGR - GXHR (223)

HXLR = HSGR - (HXGN*IXGP/100) - (IXHR - GXHR) + IROR (224)

IXLR = HXLR + GXLR (225)

These variables are important to study the net resultant of all domestic activities on the net external position of the economy and its breakdown according to behavioural sectors. They are also used to check on the outcome of the simultaneous solution of the model in the prediction stage, and they will be considered in more detail in the following Part on Model Validation.

III.e) Labour Force and employment:-

One of the areas which raised a number of problems during the preparation of data was that of employment. In spite of the difficulties involved we had attempted to break down employment by sector and estimate sectorial labour-demand functions. On the other hand, total employment figured out as one of the determinants of GDP, i.e., of the total value added of those sectors. The supply of labour is decomposed into two parts; domestic supply which is considered as a function of total population, the latter being considered exogenous; while foreign or imported supply was considered exogenous. However it was not possible at this stage to make use of this supply-demand analysis to determine the rate of wages. We used it instead to check on the unemployment state, since this is considered one of the main indicators that have to be watched by planners especially in the immediate future due to reasons given before.

III.e-1) The Supply of Domestic Labour:-

To estimate the labour force, we related its size (in thousands) to the size of population. This gives what may be considered a marginal participation rate. It is expected that the average rate would change over time, hence we introduced a trend term. Two interesting features may be observed. The marginal participation rate was as low as 6.7%, and the trend turned out to be positive and significant in spite of the already observed fact that the average participation rate was falling over the period of study. Thus at a given point of time a larger population adds some 6.7% of its size to labour force; while for the same population time leads to an increment of 6.3 thousands to labour

force. These results do not look unreasonable. The main adjustment of the supply of labour is implemented through importation of expatriates, IKMQ. Thus:

IKLQ = 201.438 + 0.0670 IKPQ + 6.3280 EKTQ -9.6924 DKLQ (219)

with ACD = 0.9989, D-W Ratio = 1.8354

III.e-2) The Sectorial Demand for Labour:-

We have attempted to estimate sectorial demand functions using the value added by sectors as the main explanatory variable with a possible trend effect or a distributed lag effect. It may be recalled here that the specific method of estimating sectorial employment led to dummy variables which represnted shifts for some consecutive years as a result of the interpolation process used, although they differed from one sector to another.

i) Employment in the **agricultural sector** raised the need for defining first what may be considered as value added free of the accidental variations due to climatic conditions. As stated before such a value is taken as three-years moving average which means that we define it as:

SAAN = SAVN - SADN (211)

where SADN is the deviation due to accidental variations and is considered exogenous for our purposes. The equation justified the introduction of lagged employment in the sector which reflects the effect of employment persistence in the sector irrespective of its level of activity:

SAEQ =11.9191 + 0.0825 SAAN + 0.7129 SAEQ& +11.2564 DAEQ (212)

with ACD = 0.9657, D-W Ratio = 2.3928

ii) A similar function fitted the **mining and quarrying sector:**

SQEQ = 0.8250 + 0.0338 SQVN + 0.7342 SQEQ& - 0.5370 DQEQ (99)

with ACD = 0.9958, D-W Ratio = 2.1665

In this case, as in that of agriculture, short-term labour mobility is low. Output variations need not bring about immediate adjustments in employment to changes in the level of activity. Hence the persistence phenomenon observed in both sectors.

iii) For the **manufacturing industry sector** a trend variable replaced the distrinuted lag term. There seems to have been an expansion in the employment of this sector which took place over time, irrespective of adjustments, up and down, with the level of activity of the sector. This proved to be the second of two cases where there was no need for a dummy variable. Frequent industrial surveys seem to have contributed to this, since - unlike the case with other sectors - more first-hand information on employment is available. Hence:

SBEQ = 16.8274 + 0.1034 SBVN + 0.8069 EKTQ (213)

with ACD = 0.9935, D-W Ratio = 1.7883

iv) Employment in the **water and electricity sector** is another case of the employment persistence pattern:

SEEQ = 2.1430 + 0.0692 SEVN + 0.3362 SEEQ& - 1.3499 DEEQ (214)

with ACD = 0.9955, D-W Ratio = 2.1864

In apite of the fact that these sectors were among the more dynamic sectors in the economy, employment seems to be related to capacity installed which makes it determined by already established levels, besides the effect of current activity.

v) On the other hand employment in the **construction sector** is another case of a trend effct besides that of value added:

SCEQ = 6.0261 + 0.1399 SCVN + 3.6542 EKTQ + 11.1121 DCEQ (215)

with ACD = 0.9919, D-W Ratio = 1.9889

This seems to be a characteristic of sectors that moved ahead of the rest of the economy during the boom years, with the exception of electricity for reasons given above.

vi) Employment in the **transportation sector** represents a persistence effect, which is due to the nature of the activity of the sector:

SPEQ = 2.4861 + 0.1336 SPVN + 0.5927 SPEQ& + 0.9971 DPEQ (216)

with ACD = 0.9982, D-W Ratio = 2.2026

vii) A similar equation fits the **trade and restaurants sector**, which resembles in nature the transportation sector:

SDEQ = 5.9217 + 0.0245 SDVN + 0.7994 SDEQ& + 5.0758 DDEQ (217)

with ACD = 0.9961, D-W Ratio = 2.0881

It may be noticed, however, that the persistence factor is much more pronounced than in the preceding sector. Again this fits with the specific nature of each.

viii) The **financial services sector** follows also the same pattern and for the same reason, but with a much smaller persistence effect, since adjustments here are much quicker:

SFEQ = 2.0180 + 0.0241 SFVN + 0.3989 SFEQ& - 0.8889 DFEQ (218)

with ACD = 0.9920, D-W Ratio = 1.7147

ix) By contrast, the **services sectors** belongs to the group of sectors which exhibit a trend term, although they are not among the more dynamic cases:

SSEQ =57.6583 + 0.0769 SSVN + 8.0466 EKTQ + 11.8099 DSEQ (102)

with ACD = 0.9963, D-W Ratio = 1.8347

This concludes the set of sectorial demand equations. All sectors show significant terms of value added in their labour demand equations. Apart from that two patterns were distinguished. The first indicates the tendency of the employment in the sector to expand over time irrespective of its current level of activity. This is the case with the manufacturing industries, construction and services. The first two were among the more dynamic sectors during the period of study. Employment seems to have been going ahead of growing activity under the momentum of expansion. In the case of services this is an expression of the tendency of these sectors to act as a last resort,and of the relatively looser tie with productivity requirements - at least in the short run. The second pattern is one of employment persistence, and it applies to all other sectors. In general it applies to sectors whose capacities do not respond immediately to short-term changes in the level of activity. Capacities, hence employment usually grow to allow for large ups and downs in current activity. This distinction seems thus to fit with the natures of the respective sectors, and with their actual developments during the priod of estimation.

III.e-3) Total Employment and Unemployment:-

i) Adding up sectorial demands leads to **total demand for labour:**

IKEQ = SAEQ + SOEQ + SBEQ + SEEQ + SCEQ + SPEQ + SDEQ + SFEQ + SSEQ (119)

IKEQQ$ = Ln(IKEQ) (120)

ii) Accordingly **unemployment** may be defined as:

IKUQ = IKLQ + IKMQ - IKEQ (220)

where IKMQ stands for expatriates (imported labour) who are the external source of labour, and are included in employment figures.

III.f) CONCLUSIONS:-

The above exposé indicates that in spite of the many defects of the data base and the need for enforcing some extra estimates especially for deflators, the outcome does give some insight in the mechanism of the Jordanian economy. Structures and coefficient estimates of the various functions of the model are encouraging, in the sense that they do fit with theoretical reasoning. In many cases we had to probe for appropriate formulations, and the exercise seemed worth the trouble. The estimates finally selected, besides representing good fits, do conform with economic reasoning. It is interesting to notice that the rather doubtful basis for deflators did not blur the fact that relative prices did play a role in a number of behavioural equations, with

the correct signs. Further the effect of income distribution figured out in the right places, again with the right sign. Purely exogenous variables such as time trends, Gulf GDP and euro dollar interest enhanced the explanatory power of the relevant equations, and they appeared in the right places. We did hope for a production function with more freedom to assess the scale of returns, but the outcome will be found, in Part IV, to overcome the restriction we imposed and to provide estimates of high stability for a variable that is key to planning activities. The trouble taken in estimating the capital stock and employment and its breakdown proved to be not in vain. Thus we may expect our model to be a workable one. This has to be tested by appropriate validation tests, which will be the subject matter of Part IV. The model suffers, however, from the absence of some parts that would be of relevance to policy issues. The price determination process as well as the integration of monetary variables remain standing for future studies. Nevertheless it covers most aspects that are usually relevant to plan elaboration.

The most annoying problem was that of the estimation properties of the equations. Generally, speaking coefficients of determination were quite high; in some this was accompanied by multicollinearity. But the nuisance came from the fact that in spite of high correlations, autocorrelation was a frequent visitor; in most cases being positive. Table (12) gives estimates for the same set of equations before introduction of dummy variables for the purposes of comparison. In the majority of cases the adjusted coefficient of determination is greater than 0.91. The least value is that for GRIR as mentioned before.

Treatment through dummy variables (of which only two stochastic equations escaped) could be justified on a priori grounds in some cases. But in others, investigation of observed deviations decided the pattern, which may be questionable and raises difficulties with respect to the degree of significance to be ascribed to the outcome. In any case this method led to quite good fits (which improved the already high fits) and to getting rid of existing autocorrelations. More has to be done with respect to data brushing before more sophesticated techniques are called upon. On the other hand it was not possible to apply methods of estimation that explicitly take in consideration errors of observation and simultaneous euqation disturbances. It is possible to apply partial information methods. For example, we can be selective in each equation in choosing instrumental variables from among the set of predetermined variables which are considered closest to representing the systematic parts of the variables in that equation, and use the estimates thus obtained in a second stage to obtain estimates of the structural parameters. But this will involve us in an arbitrary rule of selection. The more we need instrumental variables, the less will be the degrees of freedom left, and the closer the fit is to actual observations, merely as a result of that. With high OLS correlations the final result will come close to the OLS estimates themselves. There remains the fact that the predictive nature of the exercise reduces the worries in this repect.

IV- MODEL VALIDATION

Introduction:

The process of validation of such a system of simultaneous equations may be approached in two different ways. The first is to assess the reasonability of solving the model for the period of estimation itself. For this purpose certain tests exist and will be considered below. The second is to test the solution of the system for points of observation falling outside the estimation period. Unfortunately this could not be done in our case since we employed all available points of observation for the purposes of estimation. Points preceding that period cannot be so used since they represent a different economy. On the other hand it was neceesary to exploit the existing series up to the end, not only to increase degrees of freedom, but also to reach the end year which is considered as the base year for future plans. However, since the economy was exposed to all sorts of change in the level of activity, including violent changes in the external factors that play a strong role in deciding its fate, we may consider the test of the historical period as an indication of the capability of the system to deal with similar or more modest changes in the future.

Since the model is relatively large and includes nonlinearities as well as lag effects, it needs a special treatment in its solution, which is needed for testing its validity and for using it in building up scenarios which are required as a first step in the planning exercise. We shall outline first the computational method of solution, then move to a discussion of some validation tests. The solution is represented in terms of the prediction of the historical period. The method can then be applied without difficulty to the future.

IV.a) Method of Solution:-

The solution of a system of simultaneous linear equations is one of the classical issues of computation. One starightforward method is to turn the system into a form which does away with simultaneity. For an econometric model this means dealing with it in its **reduced form**, where each equation contains one single (jointly) dependent variable. Other variables in the equation belong to the set of predtermined variables, whether exogenous or lagged values of (exogenous or endogenous) variables(*). These latter do not raise any problem since their values are either given (for the initial point and for the exogenous variables) or obtained through the successive solution of the model for endogenous variables. The solution is thus realized through the set of

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(*) For prediction purposes we may add judgemental values of the "disturbances", which are called "add factors". cf., e.g., Michael D. Intriligator : Econometeric Models, Techniques and Applications. Prentice-Hall, Inc., 1978, pp. 515 - 525.

"multipliers" which are required on their own for other analytical purposes.

This process is somewhat cumbersome. It requires a painstaking process of eliminating identities (though this is not a must) and inversion of matrices. If identities are retained, the order of the reduced-form matrix is rather large, and this may lead to reduced accuracy of the elements of the inverse, unless high precision equipments are used. Therefore, **iterative methods** are frequently recommended; they are in fact indirect technique of matrix inversion. Such methods are, for example, used in textbooks for solving input-output matrices, not only for convenience of computations, but also to give some insight in the nature of the whole process.

One of the well-known iterative methods is the **Gauss-Seidel** method. It starts by selecting in each equation one variable as a dependent variable, different for each equation. This means that values of other variables in the equation (together with parameters) are assumed given. For predetermined variables this is the case. For other jointly dependent variables we have two cases. Either their values are already calculated (though may be in a rudimentary way) in a previous equation,hence they are available. Or they are still to be computed further in the model, in which case we have the freedom of giving them some arbitrary working values. For example, in the case of temporal variables, it may be the value of the preceding period, making use of the normally high positive serial correlation of economic series. Any other value within, or close to, the admissible region of the values of the variable would do. One such choice is a zero, provided that this does not lead further below to unacceptable results as we shall indicate soon. As we move from one equation to another these arbitrary values may be replaced by new values obtained from the equations for such variables, and substituted in following equations in which those variables appear.

Completing the round, we obtain a set of solutions for all jointly dependent variables. These solutions are not consistent, but they would have taken care of simultaneity in a partial manner. In a sense they will be generally closer to the final solution than the initial arbitrary values. Hence they may replace these latter in a second round of calculations, and lead still to better approximations. Another round would still improve the results, and come closer to the final solution. This process of **convergence** is ensured if the system does have a real finite solution. It may be noticed that if the order of equations is such that the variable selected as dependent, depends most on variables in preceding equations and least on those in following equations, the process of convergence is much quicker. To express this in terms of matrices, this would bring the coefficient matrix of the jointly dependent variables close to triangularity. As we know the process of inversion itself can be reduced to a process of decomposing the coefficient matrix into (two) triangular matrices and exploiting the ease by which the inverse of a triangular matrix can be calculated.

We have made use of the above property for another reason. As mentioned before, the model involves a number of nonlinearitis arising either from transforming some variables into logarithms, or using them in a ratio form. Care had to be taken lest intermediate values of variables whose logarithms are introduced assume unacceptable values: zeros or negative values. Similarly variables figuring as denominators in ratios should be non-zero. Otherwise infinite values will appear, and may lead to similar results for many other subsequent variables, in an unrepairable manner; in the sense that further recalculations will not correct the situation. Therefore we had to decide on an **order of computation** of the variables (see Table 3) which avoids such hazards. Thus we begin by listing the exogenous variables, starting with the dummies. Jointly dependent variables are then taken close to the above-mentioned traiangularity rule as much as possible. Further, the order of logarithmic transformations and ratios avoids the possibility of infinite values.

Having done that we proceeded to solve the model for the historical priod 1967-1985 (with some lagged values in 1966 as initial values) using the aforementioned **Lotus 123** spreadsheet package and an XT desk computer. The process goes as follows(*):

1) In the first three columns of the sheet we register from Table (6) the stochastic equations of the model in a vertical form. Results of the estimation stage are copied (transposed) to this region, in order to avoid errors, and to preserve at the same time the maximum degree of precision of the parameter estimates. In the fourth column we list the symbols of the variables in the order indicated above. Leaving space for headings of the table we start by the 6-th row and go further down to row No.225.

2) In the fifth column we insert the 1966 values for all variables which appear in the equations with a lag; no other values are required in that column. Values of exogenous variables for the rest of the period are then registered in the following columns. Values of current endogenous variables are left for the computation process.

3) In the sixth column we compute the values of the jointly dependent variables for 1967 using the equations in Table (5) and refering to the coefficients of the stochastic equations by their absolute positions in the first part of the sheet.

4) In doing that, variables which follow in order that of the equation in which they are inserted, automatically assume a zero value. Once all equations are computed for 1967, they are copied to the columns for the following years 1968-1985, i.e., to the columns G to X, and for all variables, i.e, the rows down to the row number 225.

(*) This is an elaboration of the method suggested by, Jan-Henrik Johansson : "Simultaneous Equations with Lotus 1-2-3", BYTE, February, 1985. pp.399 - 405.

5) We shift the computer's method of calculation from automatic to manual: command [/WGRM]. We also shift the order of calculation to "column-by-column" : command [/WGRC]. This ensures that in further calculation rounds earlier columns (years) are calculated first, hence supplying lagged values, and at the same time ensuring the convergence from left to right. This means that if we secure the convergence of the values for the last year to their final solution, this ipso facto implies the convergence of preceding years to their final solutions.

6) In column Y which follows that for the year 1985 we register in row 98 for the first jointly dependent variable,i.e., in the cell {Y98} the absolute difference btween the preceding and following columns: [@ABS(X98-Z98)]. Since {Z98} is still void, this difference is the same as the absolute value for 1985. We copy this formula to the end of the column, i.e., down to row 225. We then define the maximum of this column e.g. in cell {Y227} by means of the formula [@MAX(Y98..Y225)].

7) In the following column, Z, we copy the 1985 column, starting in {Z98} by the formula [+X98], which again is copied to the end, i.e, to {Z225}. Since calculation is manual, this will not affect the differences in column Y. In other words, the last three columns will have the same values except for sign.

8) We then create a "macro" under the name \Z, for example, which employs the "IF" condition:

'/XIY227>0.001 {CALC}/XG\Z

This macro starts a process which the computer reads as follows : It considers the value in the cell No. {Y227}, and "if" it finds it greater than a small value which we specify so as to ensure the accuracy of results up to, e.g., the second decimal place, (0.001), it starts a round of calculations. In doing that, the column-by-column order makes it start by recalculating 1967, then the following years up to 1985. When it reaches the column of absolute differences it uses the new values of 1985 and subtracts from them the values in the last column which still holds the preceding values of that year, and calculates their maximum. Then it moves to the last column and inserts the new 1985 values. When the calculation process ends, the /XG command puts the macro back into work. It applies the if condition once more to the cell {Y227}. If the condition is fulfilled it stops. If not it starts another round of calculations. Recalculations may be obviously implimented manually; we may use the recalculation key [F9] any number of times watching the value in cell {Y227}. The repetitive property of the macro saves us the trouble, since it follows the same manual process, saving keystrokes and time.

9) When recalculations stop the largest absolute difference is less than 0.001. Other deviations are ipso facto smaller. As may be expected the decisive variable in this process is the largest variable in absolute values; in our case it is the capital stock. We may have chosen it as the criterion for the "if condition". It is safer to go by the whole set of absolute differences rather than a single one. The process normally takes less than 8 minutes

once the macro is invoked. The stability of the last year, 1985, ensures the same for the whole period.

10) In the following part of the sheet we copy the values of all jpointly dependent variables, in the same order, and in the same columns. This may be also followed by another part in which deviations (predictions - actual values) are calculated. Thus if the first actual value of variable No. 98 is inserted in cell (F230), the remaining actual values will occupy the range down to (X357). Starting deviations in the cell No. (F360) by the formula [F98 - F230], we copy this formula down to (X487). This provides us with all the computations needed to apply validation tests.

IV.b) Validation Tests:-

The most widely used tests are those devised by Theil who paid much attention to the problem of forecasting(*). These tests are in fact derived from an attempt to improve on other attempts to measure goodness of fit by considering the regression of P (predictions) on A (actual observations). He indicates that it is not sufficient to obtain a high correlation coefficient,but there is the other condition that the regression coefficient has to be equal to unity; preferably calculated with zero intercept to account for any bias in the predictions(**). It is still illuminating to consider such regressions before discussing the measures he suggested as an alternative. In fact these measures go one step further, depending on the analysis of variance of the residuals from such regressions. For further insight we shall also calculate, and discuss, the relative deviations (P - A) / A, and their temporal behaviour.

IV.c) Correlations and Regressions:-

Let us retrieve the correlations obtained from the process of single-equation estimation, disregarding corrections for degrees of freedom. Let us also fit ordinary regressions of the predictions obtained from the solution of the model on the actual observations. Table (11) gives, for the variables estimated by means of stochastic equations, the correlation coefficients of these regressions in its first column. Ratios of the squares of such corrlations to the coefficients of determination of the single-equation estimates are given in the last column. The last but one column gives the deviations of regression coefficients from their desirable value of unity. Similar statistics (except for the second) are given in Table (9) for all variables in the model. The results exhibit some interesting features:

(*) H.Theil et al: Economic Forecasts and Policy. North-Holland Publishing Company. Amsterdam, 1958.
See also, A.Koutsoyiannis : Theorey of Econometrics. Pitmans Press, Bath, 1973. Chapter 20, pp. 469-487.

(**) H.Theil, op.cit., pp.31-32.

i) The fits obtained from the simultaneous solution of the model are not necessarily always poorer than those obtained from the single equations. In some cases the correlation coefficient,originally high,still receives some improvement. This is the case for e.g., SIVN, GTSR, GHRR, GRFR and SBEQ. However,this may be accompanied by slightly large deviations of the regression coefficient from unity. Thus SIVN produces a coefficient higher by 0.0266 than unity, which is the largest positive deviation, while GTSR produces one of the largest negative deviations, - 0.0245. However since these statistics are sample values, we have to judge their significance by means of appropriate tests. Lacking an exact test, we may apply the t-test, to judge the significance of deviations of regression coefficients from unity. It can be found that the deviation of the coefficient for SIVN is 1.385 times its standard error, and that for GTSR is -1.033, both being insignificant at the 0.05 and 0.01 levels. This in itself may be taken as an indication that the model does work for at least a group of variables, namely those mentioned above and their explanatory variables. In fact this means that the explanatory variables are estimated in a way that avoids some of the disturbances that affected actual data in so far as their explanatory powers for these specific variables are concerned.

ii) Some variables are not affected by the working of the model since their equations are functions of exogenous variables only. Their predictions are the same as those obtained directly from their single-equation estimates, hence the correlation coefficients remain the same, and the ratios in the last column are unity. These are GRIR, HRWR, HRXR, IKLQ. But this does not ensure that their regression coefficients have to be equal to one. In fact, one of them, GRIR, obtains the smallest regression coefficient of all, 0.9614. Other variables, affected or not by the interaction of the model, have higher regression coefficients. This may be interpreted as indicating that the interaction of the model did not in fact impair situations which were not quite close to desirable values than the single equation estimates. Care has to be given in the first place to the single equations themselves.

iii) On the other hand, the interaction of the model did affect negatively some variables. The worst fit is that of imports of capital goods, IMKN, whose correlation coefficient went down from 0.997 to 0.940. This is followed by private gross fixed capital formation, HXGN, employment in agriculture, SAEQ, construction value added, SCVN, imports of services, IMSN and customs duties, GTMR. However their correlations range between 0.956 and 0.990.Their regression coefficients are not necessarily among those showing relatively large deviations from unity. Thus they are not poorely represented through the system, which is another indicator of its validity.

iv) If we trace the last group of variables, we can see that the lower degree of accuracy shown by the model is due to large deviations in some of their explanatory variables, which are obtained from identities or definitional relationships. Thus, for IMKN, the rate of investment RXGT has a correlation coefficient of 0.8743 only. This is partly due to the relatively low fit of total investment in constant prices. It may be noticed that in spite of the high correlation for public investment in current prices, its value in constant prices is somewhat lower. For private capital formation the results are affected by the low fit for the relative price of capital formation, RXGG, in spite of the fact that its numerator is exogenous, and its denominator does not show a bad fit. Further although the adjusted GDP, IRAN, exhibits quite a high correlation, its change need not do so. It is remarkable that in spite of that, the adjusted value added of agriculture, SAAN by itself has one of the poorest fits through the system. This may have affected the equation for SAEQ. The equation for SCVN seems to have been affected by the fall of the correlation coefficient of the construction component of investment from 0.99 in its current form to 0.969 in constant prices. The slight fall in the fit of customs duties is due to the relatively low (0.989) correlation for imports of goods, possibly as the result of the behaviour of capital goods imports.

v) Judging by the above remarks we may say that variables defined as ratios may be more exposed to larger deviations due to the interaction of deviations in the two terms of the quotient. This may also extend to cases of products, even when one factor is exogensous, as in the transformation from constant to current prices. For variables estimated directly by means of stochastic equations, the weak points lie in imports and GFCF.It is intersting to notice that in spite of the behaviour of GFCF, the fit for the capital stock came out with a correlation of 0.9995, and a regression coefficient equal to 1.0045. Again, in spite of the difficulties encountered in the formulation of the (nonlinear) production function, its solution through the system gave a correlation coefficient which is 0.9984 of the SE estimate, while the regression coefficient is equal to unity. However, when we transform the variable to original units, this latter coefficient becomes 0.9955. This led to a high fit for GDP at market prices; both variables being key to other parts of the system. They also hold a key position in planning activity.

vi) Out of the 46 variables in the group of stochastic equations two have a unit coefficient of regression, 9 slightly higher than unity, while the remaining 35 are below unity. Deviations may not, if appropriate tests are applied, be statistically significant. But we may consider the system as showing a tendency to produce predictions which become lower than actual variables as these latter become larger, i.e., over time. This need not cause worry since none of the

equations estimated showed proof of existence of serial correlation. We have to wait for other tests before stretching this particular test beyond its limits.

vii) Thus if we go back to Tables (9) & (10) we may notice that the best fits, in the sense of a unit correlation, are of the ratio type,namely the three price indices, IRPP, IXCP and HRYP followed by the price ratio RMSC. Regression coefficients for those variables are close to unity; the largest deviation (0.0041) being shown is that of the last of them whose correlation is 0.9999. By contrast the ratios IRLR amd RXGT rank low in their correlations. Thus not all variables expressed as ratios are necessarily subject to stronger deviations. We have to consider other tests, including the behaviour of deviations especially in the first part of the period, where relative smallness of the valus of variables seems to have affected the allover fits.

viii) What come out clearly of the whole list of variables are those which are defined through identities as residuals, especially if the values involved are small and when they are expressed in constant prices. Thus the worst fit is that of private transfers HRFR which could not be expressed by a meaningful stochastic equation. Correlation coefficient is 0.4264 and it rises to 0.6125 in current prices; nevertheless, its regression coefficients are not the poorest in the whole list. It may be recalled that this has nothing to do with the model per se, since it is defined in terms of exogenous variables and others which are functions of exogenous variables only. The case of the value added in agriculture is not as acute; but it is understandable in the sense that SAVN is defined as a residual and SAAN is derived from it by subtracting an exogenous variable. In this sense it catches all the errors of estimating total value added and its components in all other sectors. Therefore, the coefficient of correlation of 0.7994 is not as bad as it could have been. The same applies to the change in stocks variables since they contain all the errors of estimating the sources and uses in the economy. At constant prices the correlation is 0.4412, and the regression coefficient is 0.8929 only. In current prices correlation goes up to 0.6125; but the regression coefficient is the highest in the whole list being 1.5113. This may be understandable in the light not only of the way it is estimated, but also as a variable small in magnitude and fluctuating around zero. Another interesting case is that of total net lending. It comes out poorer in its regression than its two components for the private and public sectors. But it is relatively better in its regression coefficient than either of them.

ix) To conclude, the regression test indicates some areas of weakness but at the same time it seems that the fault lies in the first place with the individual equations rather than the working of the model as a whole. In fact there are cases where the model led to improvement of estimates. The main

adverse feature is the fact that equations included to sum up the results of the whole system such as change in stocks or net lending are not quite encouraging. While this may be of secondary importance with respect to the former, it is not so for the latter. The net lending variables are important in judging the outcomes of alternative scenarios, and their relatively low performance warns us against overusing them.

x) But we have to notice that such residual variables are not usually capcable of being expressed in terms of meaningful equations which may be fitted to them directly. The model gives us the tool to estimate them from identities as residuals, i.e., the same way their data are usually estimated. It may be also added that the behaviours of the overall residual variables give us a feel of the general performance of the model. The change in stocks in current prices gave the strongest upward bias in representing observations, while current price values showed a downward and relatively large bias. On the other hand both private and overall net lending gave upward baises in contrast to public net lending. But we have to keep in mind that these observations are contingent upon the way we define the positive and negative elements of the balance equations for these items, as imposed by the definitions of residual variables; e.g., net lending rather than net borrowing.

IV.d) Theil's Inequalities:

As mentioned before Theil was not satisfied with tests based on regressions of predictions on actual observations. He prefered to utilize rules of decomposition of sums of squares in analyzing the mean squares of differences between them. The first step is to construct the root mean square error, which is a quantum used by itself in judging predictions. Since this is not dimensionless, one way of normalization is to calculate its ratio to the sum of root mean squares of its components. This is the original version devised by Theil. Another version, which is quoted in other works is to relate it to the root mean square of actual observations only. We shall adopt the ENI practice of calling the latter the normalized root mean square error (NRMSE), and keeping the original definition as Theil's Inequality, U.(*) We shall start with these two first, and consider the components of Theil's inequality later.

IV.d-1) Overall Inequalities :-

As mentioned above two measures can be distinguished. In both of them, the numerator is the square root of the average of squares of the errors (P - A). In the first, the **normalized root mean square error**, the numerator is the average of the squares of

(*) ENI-OAPEC, op. cit., pp. 41-43.

the actual observations. This resembles the ratio of the variance of residuals from regression to that of the regressor, where second moments are taken around zero rather than around the respective means. Values of this measure are given in Tables (9) and (11) in their second columns. In the second measure **Theil's Inequality, U** the same numerator is related to the sum of the sum of the root mean squares for both actual and predicted values.

It is obvious that the two measures should tell practically the same story. The NRMSE is expected to be around twice the value of U, by definition. This may be in fact seen from Tables (9) and (11). Judging from the ranks given in the corresponding tables (10) and (12) we find that the ranks in ascending order are practically the same for the two measures. More interesting still is that the orders are reasonably close to those given by the correlation coefficients discussed above. But differences from the ranks by regression coefficients are more pronounced. In a sense this indicates that the two measures are affected by the degree of closeness of fit rather than by biases in representing the trend of change of respective variables. The bias issue will be discussed later on when we deal with the components of U.

Let us consider first the four variables detached from the interaction of the system, GRIR, HRWR, HRXR and IKLQ. The last of these preserves, in both measures, its primary position that it held in correlation. In regression, its small deviation (-0.0009) from unity gave it the 4-th rank among the stochastic variables. At the other extreme is GRIR, which maintains the same correlation rank (43) while receiving the last (46) for regression. The other two variables have their positions retarded than those calculated for regression tests. Thus again overall inequalities show that poor performances are not due to the working of the system, and that good performance in the SE stage could be maintained within the system solution. In other words, we may consider that the interaction of the system can be judged to be satisfactory.

Again the poor performance variables, IMKN, HXGN, IMSN & SCVN hold the same ranks as their correlations. If we accept 10% as a limit for the NRMSE, we find out that the variables showing lower correlations (but still between 0.94 and 0.98) exhibit high impacts of deviations. The worst is capital goods imports which failed to express the variation of observations by more than 80%. Private investment follows with 83%, imports of services with 89%, and public investment by about 90%. Apart from these, all other variables obtained from directly estimated equations show over 90% accuracy. The same may be deduced from Theil's U, where the degree of accuracy is generally over 95%.

When we consider the whole list of variables, we find that more variables are included in the poor performance set. There are 26 variables out of the 128 variables (ranks 103 - 128) whose U's exceed 0.05 (NRMSE above 10%). At the bottom of the list is the change in stocks variables followed by private transfers. The former give the unacceptably high NRMSE which exceeds 1.7, while

the latter range between 0.7 and 1.23. The ratios for the net lending variables range from 0.175 for the public sector to 0.512 for the private sector with a resultant 0.456 for the whole economy. Those for the two agricultural value added variables follow, being slightly over 0.25. To these we add capital goods imports with 0.20. If we move up the list we would be struck by the fact that the variable that follows is unemployment. For its components should be considered quite reliable: labour force has a ratio of 0.005 only (giving it the 8-th rank), total employment 0.014 (rank 11) and imported labour is exogenous. This may be taken as an indication that variables defined as balances need not be as viable as their components. However, may be said about this case (see IV.e below).

The remaining variables have their NRMSE between 20% and 10%. They include three groups:

* The first includes variables determined through estimated equations. These are HXGN (0.171); GRIR (0.103, but 0.089 for the derived GRIN); and IMSN (0.110, but 0.097 for the derived IMSR).
* The second group contains variables estimated through definitions from other variables in the model. It includes components of government revenue and transfers in constant prices, whereas the corrsponding items in current prices are derived from estimated equations with ratios below 10%. The weakest of them are customes duties (0.131, and 0.093 in current prices)and transfers to private sector(0.189 against 0.083). Other variables in this group are public investment and the rate of investment, with services exports on the border (0.101 against 0.066).
* The third group contains variables obtained from identities which seem to have cumulated the errors of components. But this is not necessarily a general rule. For example, the worst in this group is GRZR (0.192), although its major component is government revenue GRRR whose ratio (0.041) is much smaller than those of its components, some of which were mentioned in the second group. On the other hand these latter components have affected net indirect taxes, GTNN (0.140). By contrast, a variable derived from it, GSGR has a ratio of 0.088 only. The other variables in this group are HSGN, IXGN and GXLR.

We may conclude that by-and-large the behaviour of the system is again found to be reasonably good. The correlation-regression tests and the inequalities give the same general picture. While most of the variables estimated by means of fitted equations come out in good shape, those derived from definitional equations or identities, even when these involve exogenous variables, need not be as reliable. But there are instances where inclusion of more variables estimated through the model improved the final result.

IV.d-2) Limitations on the Inequalities:

The remark made above about the behaviour of the inequality in the case of variables with a small average is an indication

that the inequality is not invariant to the point of origin. To illustrate the point we indicate in the following table the various statistics of the inequalities of the unemployment variable, which involve the predictions P, the actual observations A, and the differences D = P - A.

Statistic	IKLQ	IKMQ	IKEQ	IKUQ
Means of:				
P	393.2	33.4	401.5	25.1
A	393.2	33.4	402.9	23.7
D	0.0	0.0	- 1.4	1.4
Standard Deviations:				
P	62.5	43.8	106.7	13.6
A	62.5	43.8	107.5	12.6
D	1.9	..	5.5	5.2
Mean Squares:				
P	158517	3032.2	175279	812.7
A	158520	3032.2	173872	720.8
D	3.5	..	32.1	28.9
NRMSE:	0.0047	..	0.0136	0.2003

It is clear that the numerators of the inequality U, i.e., the mean square of the differences of each of the terms of IKUQ are the least for IKLQ, and are about ten times that value for IKEQ. No value is given for IKMQ since it is exogenous, and it may be taken as zero for practical purposes. The value for IKUQ is practically the difference between the two, being 28.9, i.e., less than that for IKEQ. But the fact that the mean of IKUQ is much less than that of any of its components leads to the obvious result that the mean square for either its actual values or predicted values is by far less than those for IKLQ and IKEQ. Therefore the inequality is, by definition, much larger than that for either of its terms, irrespective of the fit itself. Thus while the inequality is dimensionless in the sense that it is a quotient which involves two quantums measured in the same units, it is nevertheless not invariant to the position of the mean of the series with respect to the point of origin. In his attempt to remedy some of the shortcomings of ordinary regression analysis, and to rely on one single indicator and its composition, Theil introduced another source of defect which might be quite misleading. If we assume for the sake of argument that unemployment was as high as employment on the average, its inequality would have been smaller than that of the latter. It may be mentioned that with the relatively high fit obtained (r = 0.9238), the deviation of the regression coefficient (0.9925) from unity is only 0.0755 times its standard error. This warns us against too much weight being given to the inequality by itself. It is for this reason that we introduced regression analysis at the same time. Hence we can feel more confident about our model, since the most notorious cases belong to the category of variables with quite small means.

IV.d-3) First Decomposition of the Inequality :-

Theil suggested an analysis of his inequality based on formulae for sums of squares such as those used in analysis of variance. The first formula distinguishes three different sources of variation in the numerator of the U inequality (hence also that of NRMSE) :-

* The first is the difference between means of predictions P and actual observations A. Positive values thus indicate a tendency for predictions to overestimate - on the average - observations; and vice versa. Thus we deal here with a **bias** term.
* The second is the difference between standard deviations of P and A. Hence we obtain a **variance** component indicating, if positive, that predictions, apart from average bias, tend to vary more strongly than actual observations. A negative value means that predictions tend to dampen variations.
* The third is a residual which is attributed to **covariance** between the two sets of values. This is given a positive sign, being the square root of a positive quantum.

Ideally the first two items should vanish, as a condition that predictions should have the same distribution as observations, with same mean and same variance. The third term, which represnts covariation should also vanish in the case of perfct prediction, since it is a function of (1 - r), where the correlation coefficient r should equal +1 in the case of maximum correlation. If this is coupled with absence of the first two components, we have a case of predictions being identical with observations.

IV.d-3,i) The Bias Component, U(M):-

The bias component, U(M), is defined as the ratio of the mean of deviations (P - A), or the difference between the two means, to the numerator of the overall inequality U. Column 4 of Table (11)shows that variables directly estimated from fitted equations tend to have a negative bias. This seems to fit with what we have already observed for regression coefficients. But we have to note the difference. The bias component deals with the position of the regression curve while the regression coefficient represents its slope. Thus not only do predictions tend to underestimate (may be slightly) observations as values become larger; but also, and possibly due to the weight exerted by larger values, this tendency is a general property of the estimation period as a whole. The ranking in ascending order in Table (12) raises a number of remarks:

* The four variables detached from the system have obvioulsy zero biases. This is merely an outcome of the nature of SE estimates and has nothing to do with the interaction of the model itself.
* The largest value of the bias is a negative one, -0.0103. It introduces a new variable which did not raise any trouble with respect to overall tests, namely depreciation, IRDN. However, an interacting variable, IKKN, has only a moderate bias (-0.0053).
* Apart from capital goods imports (with a -0.0064 bias) some

other var-iables have relatively large biases in spite of their good representation. These are: agricultural employment SAEQ (-0.0069), nonphosphate exports FMUN (-0.0050), intermediate consumption IXIN (-0.0046) and transportation value added and employment (-0.0045). All of them are less than 1%. The remaining variables show still smaller biases, which is another point in favour of the system.

If we consider the complete set of variables (Tables 9 & 10) the largest bias (0.0261) belongs to private transfers which had been seen to have the lowest correlation and to reflect large inequalities.This is in spite of the fact that it is the deflated value of a variable with an exactly zero bias. It is followed by another, also positive, bias for unemployment. Two other variables have a bias over over 2% (or 4% if related to the denominator of NRMSE), viz., agricultural value added, actual and adjusted. Following in the list are change in stocks and net lending variables, depreciation and public investment. Their ratios range between 1.9% and 1.0%. The range between 1.0% and 0.5% contains customs duties, net indirect taxes, exports, public consumption, private and public savings, capital goods imports, investment rate and the ratio of its deflator to private savings deflator. All the above variables are either ratios defining variables in constant prices or expressing deflators, or the outcome of definitional equations, except for three variables estimated directly by means of stochastic equations: IRDN, SAEQ and FMUN. These observations fit with, and explain, previous findings.

IV.d-3,ii) The Variance Component, U(S):-

The variance component, U(S) is the rati of of the difference between the standard deviation of the predictions and that of actual observations to the numerator od U. It is given in the fifth column of Table (11). This time the relative share of negative values is lower than that for biases, (26 out of 46 variables). On the other hand, the upper positive tail contains larger values of ratios than the negative one. Considering the corresponding items in Table (9) we notice that:

* Three of the four detached variables have practically zero standard deviation differences. One is actually zero, and the other two are negative and less than 0.001. The fourth (GRIR) has a difference of -0.5%.
* The largest values are those of capital goods imports (1.75%) and private investment (1.37%). Other variables have differences below 1%.
* It is also interesting to notice that the production function yields a difference of 0.01% only, which adds to confidence in that function.
* Out of the whole list,the worst are again those of overall balances. Thus change in stocks has a difference of 41% in current prices and 33% in constant prices. Net lending variables have ratios of 14.5% for the private sector and 5.7% for the whole economy. By contrast public net lending has a ratio of 0.05% only.
* Variables that were found before to have relatively poor

performances show also large differences here. Thus private transfers have a difference of 30.5% in constant prices and 13.8% in current. Agricultural value added has a ratio of 2.3%, which goes up to 3.5% when adjusted. The ratio for the rate of investment is 2.4%.

* Another group of 10 variables ranges between 1% and 2%. These include capital goods imports, unemployment, public and private investments, relative price of investment and some indirect taxes items. The list comprises also public consumption in constant prices and public savings in current prices(which is the only negative one among them).
* Fourteen other variables have ratios ranging between 0.5% and 1%.

In conclusion, we may sat that the general performance with respect to the variance component is acceptable. Detached equations show small ratios, while some variables obtained through identities or definitionl equations have large differences. The worst cases are those of overall balance variables. It should be mentioned that out of all variables having differences larger than 1%, only one has a negative sign, namely public savings. This means that the poor predictions tend to vary more widely than actual observations.

IV.d-3.iii) The Covariance Component, U(C):-

We come now to the third and more crucial measure, namely the covariance component, U(C). It is defined as the ratio of twice the product of the two standard deviations times one minus the correlation coefficient to the denominator of U. By definition this component relates to goodness of fit, apart from biases in means or standard deviations. The larger the differences the smaller is the relative covariance, i.e., the correlation. Hence we expect the ratios to reflect a picture similar to that outlined by the correlation coefficient.

In general this is the case. Capital goods imports show a deviation of about 10%. They are followed by public investment, imports of services, and public income from investment abroad; all of which are above 5%. The last of them is detached from the model and is known to have the smallest correlation among SE estimates. Among the variables that have the least differences are the logarithm of GDP, labour force (which is detached) and employment equations. One should recall that these latter include feedbacks from the system since they are functions of value added variables, which in turn are functions of ther variables in the system. The fact that they are at the top of the list means that their covariance components are smaller than those of the variables from which they are derived, including the corresponding value added variables.

It may be tentatively concluded that the model has a better success in predicting variables belonging to domestic sources, i.e., GDP at factor cost, its sectorial breakdown, and the primay factors, capital and labour. Less success is encountered with

respect to external sources, i.e., categories of imports, and to the uses side especially investment, in spite of good SE fits. There may be need to reconsider the data of these variables (especially deflated values) or the structures of their equations or both. Variables derived by means of definitional equations and identities are in some cases less relaible. This is especially so for overall balances that have no feedbacks to the rest of the system.

IV.d-3.iv) Relative Components of the Inequality:-

Let us consider now the mutual working of the three components, in the shape of a **decomposition of U**. Here we make use of the fact:

$$U(M)^2 + U(S)^2 + U(C)^2 = U^2$$

Hence:

$$U[M]^2 + U[S]^2 + U[C]^2 = 1$$

where,

$$U[X] = U(X) / U, \qquad (X = M, S, C)$$

In other words, instead of relating the numerators of the ratios to the average of squares of actual (and predicetd)values, we relate their squares to the square of the numerator of U, i.e.,to the average of squares of differences between predictions and actual observatios, which is the sum of those squares. Thus the original ratios measure how big the respective deviations are with reference to the variables they relate to, while the new set of ratios show the weight of each in the deviations between the predictions and their original values. The new ratios, unlike the previous ones, have the extra restriction that their sum is equal to unity. The larger the first two components, the smaller, ipso facto,is the third. Thus we have to set limits for these relative components with reference to their total. We shall assume that the acceptable limits for U[C] are 0.80 to 1.00, which means that the corresponding limits for the other two terms are 0 to 0.20.(*). The logic of this is that the first two components represent deviations in the estimates of the parameters of the population distribution of the deviations. Under assumption of normality these are the mean and the standard deviation. This requires that deviations of means and standard deviations from their expected values should be as small as possible. The remainder represents sampling errors due to variability in the estimation of the relationships they relate to. This should be as small as possible by itself, but it should be as large as possible proportionally. With this in mind we may investigate the ratios of our system:

* Among the variables estimated by means of fitted equations (Tables 10 and 11), two variables fail the test. One is the electricity value added, whose covariance component is 0.753 only. The other is depreciation with 0.794 which is close to 0.80. The former suffers from a large (in fact the largest)

(*) Cf., ibid., p.43.

variance component, 0.245 in spite of the fact that the very good fit gives the ratio of this component to the variable itself a value of 1% only.

* No other variable exceeds the 20% limit, but three variables exceed a 10% limit, namely employment in mining (13.7%) and in trade (10.2%), and imputed bank charges (10.6%).On the other hand depreciation suffers from having the largest bias (18.4%).Two other variables have biases over 10%, namely employment in agriculture (16.4%) and in transportation (14.9%).
* It may be observed that the production function which passed previous tests shows a smaller covariance component than most other variables (94.1%) although it is quite high. This is due to a somewhat large bias component (5.65%). The next in order is employment in trade which, besides the relatively large variance component has a bias of 3.8%.
* If we go further in the list of variables beyond those directly estimated, we find that some variables behave in a poorer way than depreciation. They are in fact derived from it, namely, private depreciation and the value of total deprection in current prices. Both include a large bias component (-16.3%) which is slightly lower than that of the value in constant prices. But they have over and above a large variance component (13.1% and 11.7% respectively) which reduced the covariance component to nearly 70%.
* The two sets of overall balance variables which showed large inequalities suffer also from large variance terms and low covariance ones. This applies also to private transfers in constant prices. The variance component, in these cases, becomes responsible for deterioration, even though the variables from which they are derived may have large biases only. Capital stock, which passed the overall tests comes now at the bottom of the list as a result of malperformance of depreciation. The main reason is the quite high weight of the bias component, in spite of its smallness. On the other hand although the derived deflator of NDP holds the first rank among all variables, it seems to have been affected by differences in depreciation, which raised its variance component to 16.a%, bringing down its covariance component to 82.8, which is still within admissible range.
* The interesting feature of these observations is that some variables with low values of the inequality and its components, especially those of sectorial employment, do suffer from relative disproportionalities in the structures of the statistical distributions of predictions. This may be due to observation errors rather than feedback errors from the system itself. Again, in spite of the good fit for the production function, it seems to suffer from the same phenomenon. Otherwise, interactions of the model are not causing undue dislocations.

IV.d-3.v) A Synthesis of Inequalities:-

The basic quantum on which the inequalities are based is the root mean square error. A subdivision is once treated one by one,

where ratios are considered on their own merits. Another, and directly related subdivision, is considered simultaneously as a breakdown of the overall inequality. The logic of the above discussion points in the following direction : Judgement should be first based on the acceptabilty of the total inequality then analyzing it to its components. In fact **we may distinguish three cases :**

* The first is the case where both the inequality and all its components are within admissible regions. This is the most desirable case.
* The second, and the second best,is that whereas total inequality is acceptable, some of its components,or all, do not fall within admissible regions. The good fit may not remain stable, even under the assumption of no change in the distribution of errors. It should be recalled that the first two components represent biases which can be treated by suitable means, while the third represents random elements that we can do nothing about; albeit looking for a better fit from a reformulation of the system of equations. However, one may argue that the smallness of the overall inequality may render its components more susceptible to random elements that produce relatively larger deviations in their values from theoretical expectations without this signifying that such deviations are worth while.
* The third case is where the overall measure indicates poor fit, i.e., U is large. Here we may find that its components may still be within the permissible limits; but at least one of them is unacceptable in the sense of being relatively large with respect to the average squares of the variable itself: Thus U[X] may be all acceptable for all X, while one of the U(X) ratios at least is large. In fact if all U[X] are acceptable, then all of U(X) should be large, thus contributing to a large U. If one or two only of U(X) are unacceptable, then U will not be acceptable, and at the same time its components U[X] are disproportionate.

Thus the logic of the series of tests is that we should have the ratio **U(C) as small as possible (close fit) while U[C] is as large as possible (minimum bias).** There is still a **fourth case** which we encountered in our analysis. This is when U itself is acceptable but one of its components is large relative to the corresponding variable mean square,thus leading to disproportionalities in the composition of U.

Let us apply the above classification subdividing the variables into **four groups :** Variables detached from the system; those interacting with the system; variables estimated from definitional equations (involving quotients or products, or other transformations) and others which are defined by identities (algebraic sums). The results of this crossclassification are given in the first part of the following table (see next pages) for variables which failed the overall inequality test(NRMSE values are given). In the second part of the table variables which passed the overall test but exhibited disproprtionalities of its composition are indicated. There are seven such variables. In selecting these

variables, we abided to the aforementioned limits of : 10% upper limit for NRMSE (5% for U); a minimum of 80% for U[M] and a maximum of 20% for the other two proportions.

Variables Failing One or More Tests & their NRMSE %

Form of Estimation	Quality of proportions of U Acceptable		Unacceptable	
A) Variables failing the Overall Inequality				
I) Stochastic,Detached	GRIR	10.3		
II) Stochastic,Other	IMSN	11.0		
	HXGN	17.1		
	IMKN	20.3		
III) Definitions	FMON	10.1		
	GTEN	10.8		
	GTON	11.8		
	IXEN	12.4		
	GTMN	12.9		
	GXGN	14.8		
	RXGT	18.0		
	HGRN	18.9		
			HRFN	123.3
IV) Identities	HSGN	12.9		
	ISGN	12.9		
	GTNN	14.0		
	GXLR	17.5		
	GRZR	19.2		
	IKUQ	20.0		
	SAVN	25.5		
	SAAN	25.9		
	IXLR	45.6		
	HRFR	70.5		
			HXLR	51.2
			IXHN	173.3
			IXHR	184.9
B)Variables Passing the Overall Test but not its Proportions				
			IKKN$	0.3
			IKKN	1.6
			SEVN	2.4
			IRDR	3.4
			IRDN	4.8
			HRDR	5.2
			HRDN	6.9

The following remarks can be readily made:

* None of the variables obtained from directly estimated equations, detached or interactive, exhibited unacceptable proportions. One definitional variable has this property, while three identities did.
* One of four detached variables failed the overall test;three out of 42 other directly estimated variables did. The properrty is distinguished for 9 out of 41 definitional variables, and for 13 out of 41 identities.
* Apart from value added of electricity,the variables having small overall inequality but malproportions are those of depreciation and the related capital stock variable and its logarithm. This latter has a negligible NRMSE, and in fact none of its ratios is significant.
* Reference to Tables (9) and (11) indicates which ratios U(X) are significant, pushing the corresponding U and/or U[X] to pass their limits. If we consider the limits for each of U(M) and U(S) to be 0.5% and for U(C) to be 5%, we can easily see that most of the variables listed as failing the overall test have large variance biases. This applies to all of them except GTEN, IXEN, IMSN, HSGN and GXLR. The first three of these have no biases, and they failed due to a large U(C).
* Many variables have all components large, irrespective of the value of U. This applies for example to GTON with NRMSE = 11.8% as well as for IXHR with the largest NRMSE = 184.6%.
* Apart from IKKN$, and from SEVN which suffers from a large variance component, all other variables failing only in composition have relatively large bias components. HRDN has also a large covariance component, while HRDR and IRDR have large variance components.

To conclude, reading all inequalities together, we find that the system does work for most variables for which equations are fitted. Failures grow when we move to other categories being largest in numbers and magnitudes for identities which involve a number of other variables of the system, especially when such identities include some variables estimated through definitions or other identities. These usually exhibit some of the larger ratios in their own group. The largest ratios belong to final balances which have no feedback effects on the system. These findings are further qualified by our prior observation that the inequalities (but not the proportions) are not invariant with regard to points of origin. We may consider the system as viable in so far as the above tests are concerned.

IV.) Second Decomposition of the Inequality:-

Theil suggested another formulation of the tripartite decomposition, keeping the first component relating to bias. The other two components are labelled the regression and the disturbance components. He does not put much weight on this alternative form, but it is still useful to have a look at it

The second, **regression component**, differs from the variance component by the fact that the standard deviation of actual observations is now multiplied by the correlation coefficient. But Theil warns against asserting that this expression should always have an expected zero value, and points to the fact that empirical results do not necessarily be so(*). Again we find that the worst performance is that of overall definitional equations. Some of the variables included in the previous tables have large regression components. Thus value added in agriculture and in electricity, investment rate and the relative price of private investment have ratios exceeding 20%. The worst is change in stocks in current prices (84.5%) and private transfers in constant prices.

Values of the **disturbance component** below 80% include the above variables as well as others that have large biases. These latter comprise capital stock, depreciation and employment in agriculture. Other values above, but close to 80%, include variables which have been found to exhibit anomalies in previous tests, e.g., unemployment, imputed bank charges, NDP deflator and some sectorial employment variables. These tests do not seem to change the general findings made before.

IV.e) Relative Deviations:-

We move now to another criterion which may not be considered as a proper test, but which is intended to throw some light on the behaviour of the system as reflected by the pattern of change over time of deviations (P - A), for which tests were devised. Table (13)gives the calculated deviations for each of the jointly dependent vatiables, while in Table (14) we calculated the ratios of those deviations to the actual obervations, (P - A)/A. A quick glance at the table indicates that many variables shifted after 1973 from relatively large deviations to smaller ones.For example subsidies, GTSR, show a deviation of 177% in 1968, and another of -122 in 1973. But afterwards, the largest ratio was 14.2% in 1978 followed by 10.5% in 1985. The 1973 value indicated in fact that the estimate of the variable came out negative. Before we proceed any further we should mention the following : If the assumption of homoscedasticity is true, and the bias is zero (mean P is same as mean A), we should expect the residuals to behave randomly around zero within a range defined by their probability distribution. If A is getting larger over time, which is generally the case we should expect the ratios to get smaller over time. What we are looking for is such abrupt changes as indicated above. Ideally one should have constructed confidence regions and observed significant deviations. But the trouble is that these regions get wider at the tails, which would admit most of the relatively large deviations. In fact the residuals of SE estimates, which were free from autocorrelation exhibited a somewhat similar phenomenon.

(*) Theil, op.cit., p.39.

Three general remarks may be stated:

* The first is that actual deviations did not behave in a manner that lead to suspecting a change over time in their variability. However, we may notice that one of the weakest variables in the system, IMKN the capital goods imports did show symptoms of a larger variance at the first part of the period. Starting calculations from 1968 to avoid abnormalities in 1967 did not change the general picture.
* The second is that for most variables deviations tended to turn from high relative levels as from mid seventies. After that they rarely showed substantial values. Variables that still did are among those which were previously observed to misbehave, e.g., private transfers. The fact that the poor performances were not carried throughout via lagged values is to the credit of the system.
* The second is that the overall balance variables although tending to follow the same pattern, show the widest variations of all.

It may be thus concluded that the model which was found before to be satisfactory, does come closer to representing the economy in the last decade of the historical period. This is an encouraging sign, since extrapolations to the future are expected to be closer to more contemporary patterns. One should bear in mind two facts. The first is that data for the earlier years are not necessarily as reliable as for the later ones. This is particularly so for deflated series. The second is that the economy was subject to drastic changes during the seventies. The dummy variables used need not account for these facts, the way they were introduced. They related to anomalies of individual years, except for a few cases (such as sectorial employment variables). Other dummy variables may be tried to test for effects of other parameters than the intercepts. This is a cumbersome process which consumes time and may reduce considerably degrees of freedom.

With this in mind we may turn to the exercise of scenario building.

ALTERNATIVE SCENARIOS

Having tested our model and defined areas of strength and weakness, we may now examine a few scenarios by way of illustation. To do this we have first to obtain outside estimates of the exogenous variables in the system. The task looks somewhat difficult owing to the large number of variables involved. In a manner the choice of different configurations of these variables is in itself an exercise in scenario-building, and should turn out to be illuminating in the sense that it reflects the possible paths that the economy could take take under different assumptions. But if this is the sole purpose we could better turn it into its reduced form and obtain the set of multipliers with respect to each of the exogenous variables.(*) What we have to look for is to start with what may be considered the most likely paths for the exogenous variables and see how the system reacts to them. If some of the exogenous variables are under control, we may assign them different values to help select the most appropriate values, i.e., those which produce desirable results, especially with respect to main "target variables". A purely "target-setting" approach would involve reformulation of some equations so as to reverse the direction of causation, i.e., to determine those exogenous variables variables which would help achieve prdefined results.(**) We shall confine our explorations to the cases related to the actual plan 1986-1990, to see how far results tally. The exercise will start with a "trend-scenario" where we assume most recent trends to persist. We then turn to the assumptions made by the plan document, and in doing that we shall cast the details of the plan in the format suggested by our system. All this may be considered as a **pre-planning activity** where the planner starts by having a feal of the problems ahead.

As mentioned before (p. 50) we could inject some judgemental elements to express likely events that could not be captured by the model. More generally we could introduce probailistic statements to account for possible paths of the disturbance elements. This would turn the whole work from a mathematical simulation to a stochastic one which rapidly increases the number of possible scenarios. This is beyond the scope of this study. We therefore remain satisfied with a few scenarios where we indicate by how far the model differs from the plan, and by how far the plan itself deviates from recent trends. We shall add another scenario where we assume constant prices throughout, which is an assumption adopted by many planners. It seems that this was the case with the current plan, where prices were superimposed to assess the implications for the government and external sectors. One

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(*) See the. pioneering work by Arthur S.Goldberger : Impact-multipliers and Dynamic Properties of the Klein-Golberger-Model. North-Holland Publishing Company, Amsterdam, 1959.

(**) See, e.g., J.Tinbergen : On the Theory of Economic Policy. North-Holland Publishing Company, Amsterdam, 2nd ed., 1955.

alternative could have been to assume all prices rising by the same rate. On its face value this would look like a case of constant prices. But we should remember that some variables are functions of rates of change of prices, which would not be zero as in the constant price case. Other assumptions could be easily tested and we leave them to the discretion of the reader.

The **plan** was not based on a model. In fact the "Mathematical Framework referred to on p.2 before attempts only to ensure the consistency of the structure of the plan. It was indicated that the basic starting point was past trends. These were preserved unless indications point towards a change. In this sense the impact of changing conditions and policies in the Gulf countries were captured. This was complemented by a deliberate policy to cut down reliance on expatriates. In most cases, individual variables were projected on the basis of rates of growth (zero or otherwise), but no explicit econometric estimation was introduced except in a couple of cases. There was mention however of estimating incremental capital/output ratio for a segment of the economy from historical data covering the period 1975-1984. This segment is a leftover after a number of key activities were predetermined exogenously both as value added and investments therein. We have attempted to trace their capital/output ratios, but we obtained awkward results. The ratios for the whole five-years period were less awkward, but they left a lot to be desired. This is in line with our prior observation, that there is a lack of sectorial breakdown of investments, and of even C/O coefficients. Again the assumptions about prices were more of guestimates, and they were only introduced to obtain series for the government budget and the foreign balance in so-called current prices. In this sense we can safely assume that the main work in the plan frame was implimented in the base-year (1985) prices, regardless of price effects. Price series introuduced later tended to exagerate revenues vis-a'-vis expenditures. As we may recall our system has gone halfway between assuming prices exogenous and endogenyzing them.But they were introduced among explanatory variables and in such cases they turned out to have significant effects.

To tie up the plan system to ours, we have added a new set of 76 variables, Table (16). Most of these can be easily obtained from our model as it stands. In fact we have tried some equations for some of them, e.g., imports of oil and workers remittances received, but we eventually did away with them for one reason or another. The main variables which were lacking are those on the foreign capital account, namely private equity investments and the repayments of the principal of foreign debt, on which future information was not available to us. We have ventured introducing estimates of depreciation allowances to fit with the plan data in order to tie the two systems together. The main results of the plan frame are given in Table (15), using our system of notation. We have relied on a computer outprint attached to the above-mentioned mathematical note. One correction was due however; and this was the adjustment of the base year values to their new estimates which became available after the publication of the plan (and even after an earlier draft of the present study was

prepared). In doing that we had to adjust the values for the remaining years. Value added increments and corresponiding investments were maintained, since they were tied together. This left rates of growth to be reestimated. Whenever an equation was used we abided to it in order to maintain the logic of the frame. This eventually left balances to bear the resultant of corrections, which can be seen from comparing data for saving and borrowing. For memorandum, we have introduced into the right-hand side of Table (15) base- and end-year estimates as they originally stood, and the corresponding growth and change rates.

It is familiar to test a **trend scenario**, and the results of such a scenario are given in Table (17). Here we have attempted to stick to the letter, in the sense that each variable was left on its own, with no attempt to introduce any extra knowledge about the future. This is not quite advisable; but we meant it as a test for the model under rather poorely manipulated values of the exogenous variables. The relevance - though not quite tight - to the plan assumptions arises from the fact that the main theme was a trend one, but with appropriate treatment in some cases. Therefore we decided to turn the scenario in the direction of the plan by inserting values for the exogenous variables derived from the plan iteslf, or consistent with it. This gives us the **Plan-bsed scenario** whose results are given in Table (18). Finally, since it was noted that the price structure was not an integral part of the plan itself, we adjusted the latter scenario to obatin another one in **constant prices.** Its results are given in Table (19).

A **summary** of the plan and the three related scenarios is given in Table (20). A number of features emerge:

* All scenarios predict a lower rate of growth than that envisaged by the plan. The services sectors (social and financial) suffer most, and they represent about one third of GDP. The trend scenario gives a relatively higher rate, but this was shifted to an unreasonably high rate of growth of the agricultural sctor, which is estimated as a residual. When we adopted the assumptions of the plan, the agricultural rate of growth went down considerably. A correction took place when we used constant prices, but still the rate came lower than that of the plan. One may recall that the plan used predetermined growth rates, and it seems doubtful that these rates are going to materialize; modest as they may be in comparison to those of the previous plan.
* The low profile of the economy is accompanied by a modest growth rate of imports of goods and services. The trend scenario compensates the relatively higher domestic rate by a much lower imortation. The plan-based scenario is in line with the plan estimate, whereas the constant price scenario subdues both rates: domestic and external.
* The overall picture for sources of the economy comes close for all scenarios, but it is less than half that envisaged by the plan. As we recall, availability of financial resources plays an important role in the Jordanian economy, and these are becoming tight in the next few years. This fact seems not to

have been sufficiently catered for in the plan.

* The three scenarios predict a lower rate also for exports, which fits with their lower growth rates of domestic output. This again is a reflection of the gloomy picture in the part of demand related to the Gulf countries. If exports do grow modestly, their impact on the economy will be dpressing. It would be interesting to study the impact multipliers related to determinants of exports. However, we have to bear in mind that GDP itself was among the explanatory variables. Dynamic effects have to be further investigated.
* The plan expects a modest growth rate for total final consumption. The scenarios keep the same distance, with trend scenario showing an actual decline. It should be observed that the plan produces a rate much lower than that of population, which is a point that has to be borne in mind. If this is true, appropriate economic policies have to be formulated. Otherwise there will be inflationary pressures, which may manifest themselves in a number of ways.
* In all cases it is the household consumption that bears the brunt of the slowdown, although the trend scenario predicts a milder absolute fall.
* The derived estimates for investments indicate that the plan gives more weight to the growth of private investment towards the end of the period.The three scenarios indicate a different pattern although the private sector seems to have to grow much faster than the public sector. It is interesting to notice that the trend scenario gets rid of the imbalances in the shape of a rapidly growing piling up of stocks. These remarks reflect the poor representation of the acceleration principle arising primarily from lack of data.
* The discussion of the gross fixed capital formation should be better conceived in terms of totals for the five years of the plan, since the end year may give a poor picture. For example, the annual distribution for the government sector is frequently affected by the rush of all and each project to start and finish early, especially if it is justified on the basis of targets within the five years themselves. On the other hand the overall steadily growing pattern would leave a larger share for the ambiguous investments of the private sector. We notice that the total of 2665.6 for the plan-based GFCF is practically the same as that for the plan itself.These figures are obtained by means of a deflator derived from the scanty data in the plan, which gives the total in current prices only, while constant prices are used in sources and uses with annual distributions. The trend scenario aggregate is somewhat less, 2562.4; while the constant price scenario brings about another drop to 2444.5. But it does that with a more even distribution over the years.
* The three scenario envisage a much larger increase in the negative income from investment abroad. This is the impact of the recent past trend. Even the plan-based scenario comes out much higher than the already high plan figure.
* Again the trend scenario predicts a quick fall in net workers' remittances aginst the modest increase expected in the plan. The plan-based scenario is more generous, while the constant

prices one warns against a small fall.

* The three scenarios predict a larger increase in net external transfers to the private sector and a slower decline in those for the government. The trend scenario exagerates both tendencies. As a result the differences in the rate for national disposable income are smaller than those for the national income. The share of the private sector is much more modest than that of the plan, and all of them keep the same distance from the growth of private consumption. But even the plan reflects a small decline in the per capita share. The share of the government sector is declining in all three scenarios, which could have been reflected on the already observed depression in the services sectors.
* The above variations brought about another contrast between the various versions with respect to savings. Thus whereas the plan depicts a quick closing of the gap in domestic savings, turning them into a small negative value, the process is much slower in the two related scenarios. The trend scenario turns them into a positive value.
* On the other hand, this has been reflected in a more modest rise in the growth of savings out of national disposable income as compared with the high planned rate. This applies even to the trend scenario.
* As a result the plan envisages a much slower rate for net borrowing on the current account, which may be due to the direct impacts of trends, as may be seen from the small fall in the trend scenario.
* The plan envisages an employment growth rate lower by 10% than those predicted by the related scenarios. In a sense this looks more consistent with GDP and GFCF growth rates especially when compared with the trend rate. This latter calls for a rapid growth in imported labour, which is deliberately cut down by the plan in a rapid manner. We were not able to estimate the rate of unemployment from the plan document. The trend scenario couples the increased labour importation with a rise in unemployment, which reflects the awkward outcome of the recent practices. But the remarkable feature of the two plan-based scenarios is that such a rapid decline in labour importation brings about a shortage of labour. If this shortage is imported the total of expatriates would remain constant at its base year level. As mentioned before, the employment problem deserves more attention.
* In general all scenarios show a slower growth in sctorial employment than the corresponding outputs. The notorious element remains to be the services sectors, which were subject to a trend that uplifted their employment against a poor performance in output. More analysis of such a behaviour should await building up of scenarios varying considerably in their assumptions.

To **conclude**, we may say that the model may reflect certain anomalies. But these are essentially a function of the consistency of the assumptions underlying the given scenarios. On the other hand, the plan involves certain assumptions which leave so many questions unanswered; particulay unemployment.

Table (1) Changes in the Economic Structure
1968-1972 to 1981-1985

Items	Values, m. J.D. A=1968-72	B=1981-85	% Distribution (A)	(B)	% Change (B-A)/A
I. AGGREGATES IN 1985 PRICES:-					
I.1. COMPOSITION OF GDP:-			% of GDP @ FC		
Primary Sectors	266.4	707.2	9.8	11.2	14.5
Secondary Sectors	471.4	1703.1	17.3	26.9	55.8
Distribution Sectors	1096.7	2443.3	40.2	38.6	-3.9
Other Services	894.3	1475.1	32.8	23.3	-28.9
GDP at Factor Cost	2728.8	6328.7	100.0	100.0	********
I.2. SOURCES AND USES:-			% of GDP @ MP		
NDP at Factor Cost	2605.2	5774.4	85.7	78.7	-8.1
Depreciation Allowances	123.6	554.3	4.1	7.6	85.8
GDP at Factor Cost	2728.8	6328.7	89.8	86.3	-3.9
Net Indirect Taxes	311.5	1005.6	10.2	13.7	33.8
GDP at Market Prices	3040.3	7334.4	100.0	100.0	********
Imports, Goods & Services	1755.1	7983.3	57.7	108.8	88.6
Total Sources	4795.4	15317.7	157.7	208.8	32.4
Household Consumption	2640.9	6956.6	86.9	94.8	9.2
Public Consumption	1178.1	1911.5	38.7	26.1	-32.7
Total Final Consumption	3818.9	8868.1	125.6	120.9	-3.7
Gross Domestic Savings	-778.6	-1533.7	-25.6	-20.9	-18.3
G.F.C.F., Total	506.7	2669.0	16.7	36.4	118.4
Change in Stocks	50.3	88.3	1.7	1.2	-27.2
Total Investment	557.0	2757.4	18.3	37.6	105.2
Total Domestic Expenditure	4375.9	11625.5	143.9	158.5	10.1
Exports, Goods & Services	419.5	3692.2	13.8	50.3	264.8
Resource Gap	-1335.6	-4291.1	-43.9	-58.5	33.2
Capital Stock	12741.8	28166.9	419.1	384.0	-8.4
Capital/Output Ratio	4.7	4.5			-4.7
II. POPULATION AND LABOUR FORCE:-					
II.1. TOTALS:-	(In Thousands)		% of Population		
Total Population	7554.6	12490.4	100.0	100.0	********
National Labour Force	1640.1	2379.6	21.7	19.1	-12.2
National Employment	1459.0	2254.0	19.3	18.0	-6.6
Total Employment	1459.0	2746.2	19.3	22.0	13.8
Rate of Employment	89.0	94.7			6.5
Value Added per Worker (JD)	1870.3	2304.6			23.2
Capital/Labour Ratio (JD/W.)	8733.2	10256.8			17.4
II.2. EMPLOYMENT BY SECTOR:-			% of Employment		
Primary Sectors	305.5	392.5	20.9	14.3	-31.7
Secondary Sectors	256.5	706.6	17.6	25.7	46.4
Distribution Sectors	366.9	557.9	25.1	20.3	-19.2
Other Services	530.1	1089.1	36.3	39.7	9.2
Total Employment	1459.0	2746.1	100.0	100.0	********

Items	Values, m. J.D. A=1968-72	B=1981-85	% Distribution (A)	(B)	% Change (B-A)/A
III. AGGREGATES IN CURRENT PRICES:-					
III.1. SECTORIAL BREAKDOWN:-					
a) COMPOSITION OF GDP:-			% of GDP @ FC		
Primary Sectors	118.9	708.5	14.8	11.5	-21.9
Secondary Sectors	126.1	1671.2	15.7	27.2	73.7
Distribution Sectors	319.1	2355.9	39.7	38.4	-3.3
Other Services	240.1	1401.3	29.9	22.8	-23.5
GDP at Factor Cost	804.2	6136.9	100.0	100.0	********
b) COMPENSATION OF EMPLOYEES:-			% of Sector's V.A.		
Primary Sectors	13.4	186.5	11.3	26.3	133.6
Secondary Sectors	52.8	725.1	41.9	43.4	3.6
Distribution Sectors	71.0	758.9	22.3	32.2	44.8
Other Services	228.6	1297.0	95.2	92.6	-2.8
Total Compens. of Employees	365.8	2967.5	45.5	48.4	6.3
III.2. SOURCES AND USES:-			% of GDP @ MP		
Compensation of Employees	365.8	2967.5	40.3	42.5	5.4
Operating Net Surpluses	399.4	2663.1	44.0	38.1	-13.3
NDP at Factor Cost	765.2	5630.6	84.3	80.7	-4.4
Depreciation Allowances	39.0	506.3	4.3	7.3	68.7
GDP at Factor Cost	804.2	6136.9	88.6	87.9	-0.8
Net Indirect Taxes	103.1	843.9	11.4	12.1	6.4
GDP at Market Prices	907.3	6980.8	100.0	100.0	********
Imports, Goods & Services	454.8	7275.5	50.1	104.2	107.9
Total Sources	1362.1	14256.3	150.1	204.2	36.0
Household Consumption	776.1	6409.4	85.5	91.8	7.3
Public Consumption	307.3	1743.1	33.9	25.0	-26.3
Total Final Consumption	1083.4	8152.5	119.4	116.8	-2.2
Gross Domestic Savings	-176.1	-1171.7	-19.4	-16.8	-13.5
G.F.C.F., Privare	84.1	1293.5	9.3	18.5	99.9
G.F.C.F., Public	70.9	1283.8	7.8	18.4	135.3
G.F.C.F., Total	155.0	2577.3	17.1	36.9	116.1
Change in Stocks	11.8	69.3	1.3	1.0	-23.7
Total Investment	166.8	2646.6	18.4	37.9	106.2
Total Domestic Expenditure	1250.2	10799.1	137.8	154.7	12.3
Exports, Goods & Services	111.9	3457.2	12.3	49.5	301.6
Resource Gap	-342.9	-3818.3	-37.8	-54.7	44.7
III.3. FOREIGN TRADE:-					
a) EXPORTS OF GOODS			% of Classified		
Food Items	25.22	182.00	46.1	17.7	-61.7
Consumers Goods: Current	6.10	317.75	11.1	30.8	176.6
Consumers Goods: Durables	0.39	87.56	0.7	8.5	1106.8
Consumers Goods: Total	31.71	587.31	58.0	57.0	-1.7
Raw Materials: Phosphates	15.75	299.25	28.8	29.0	0.8
Raw Materials: Others	1.89	79.38	3.4	7.7	123.3
Raw Materials: Total	17.64	378.62	32.2	36.7	13.9
Capital Goods	5.37	65.05	9.8	6.3	-35.7
Total, Classified	54.71	1030.98	100.0	100.0	********
Miscellaneous Goods	0.12	0.11	0.2	0.0	-95.2
Total Exports, National	54.83	1031.09	100.2	100.0	-0.2
Re-Exports	14.80	288.19	27.1	28.0	3.3

Items	Values, m. J.D. A=1968-72	B=1981-85	% Distribution (A)	(B)	% Change (B-A)/A
b) IMPORTS OF GOODS			% of Classified		
Food Items	102.28	804.57	31.2	15.1	-51.7
Consumers Goods: Current	51.45	592.56	15.7	11.1	-29.3
Consumers Goods: Durables	20.52	413.96	6.3	7.8	23.9
Consumers Goods: Total	174.25	1811.09	53.2	34.0	-36.2
Oil & Mineral Fuels	19.81	1014.22	6.1	19.0	214.4
Other Raw Materials	54.53	888.93	16.7	16.7	0.1
Total Raw Materials	74.33	1903.15	22.7	35.7	57.2
Capital Goods	78.78	1617.02	24.1	30.3	26.0
Total, Classified	327.36	5331.26	100.0	100.0	********
Miscellaneous Goods	35.71	107.84	10.9	2.0	-81.5
Total Imports	363.06	5439.09	110.9	102.0	-8.0
c) RATIOS TO DOEMSTIC USES			% of Domestic Use		
Consumers Imports/Consumption			16.1	22.2	38.1
Raw Materials/Interm.Consum.			13.7	29.9	117.8
Capital Goods Imports/G.F.C.F.			50.8	62.7	23.4
Balance:Consumers/Consumption			13.2	15.0	14.1
Balance:Raw Materials/Interm.			10.5	24.0	128.7
Balance:Capital Goods/G.F.C.F.			47.4	60.2	27.1
III.4. TRADE IN GOODS & SERVICES:-					
a) EXPORTS OF GOODS & SERVICES			% of Totals		
National Goods Exports	54.8	1031.1	49.0	29.8	-39.1
Re-Exports	14.8	288.2	13.2	8.3	-37.0
Travel	28.6	924.8	25.6	26.7	4.5
Other Services	13.6	1213.2	12.2	35.1	187.9
Total Exports	111.9	3457.2	100.0	100.0	********
b) IMPORTS OF GOODS & SERVICES			% of Totals		
Imports of Goods	363.1	5439.1	79.8	74.8	-6.4
Travel	45.4	698.1	10.0	9.6	-3.8
Other Services	46.4	1138.3	10.2	15.6	53.5
Total Imports	454.8	7275.5	100.0	100.0	********
III.5. DISPOSABLE INCOMES:-					
a) PRIVATE SECTOR			% of GDP @ MP		
NDP at Factor Cost	765.2	5630.6	84.3	80.7	-4.4
Transfers from Government	63.3	840.6	7.0	12.0	72.6
Direct Taxes	20.4	275.9	2.2	4.0	75.8
Other Transfers to Government	25.5	215.8	2.8	3.1	10.0
Private Net Domestic Income	782.6	5979.5	86.3	85.7	-0.7
Workers' Remittances: Credit	28.9	2003.6	3.2	28.7	801.1
Workers' Remittances: Debit	0.0	377.6	0.0	5.4	..
Workers' Remittances: Net	28.9	1626.0	3.2	23.3	631.3
Income from Investment, Net	0.0	-78.2	0.0	-1.1	..
Net Factor Inc. from Abroad	28.9	1547.8	3.2	22.2	596.1
Private Net National Income	811.5	7527.3	89.4	107.8	20.6
External Transfers: Credit	8.0	83.2	0.9	1.2	35.2
External Transfers: Debit	0.0	11.9	0.0	0.2	..
External Transfers: Net	8.0	71.3	0.9	1.0	15.8
Private Disposable Income	819.5	7598.6	90.3	108.8	20.5
Household Consumption	776.1	6409.4	85.5	91.8	7.3
Net Private Savings	43.4	1189.2	4.8	17.0	256.1

Items	Values, m. J.D. A=1968-72	B=1981-85	% Distribution (A)	(B)	% Change (B-A)/A
b) GOVERNMENT SECTOR			% of GDP @ MP		
Net Indirect Taxes	103.1	843.9	11.4	12.1	6.4
Direct Taxes	20.4	275.9	2.2	4.0	75.8
Other Transfers from Priv. S.	25.5	215.8	2.8	3.1	10.0
Transfers to Private Sector	63.3	840.6	7.0	12.0	72.6
Public Net Domestic Income	85.7	495.0	9.4	7.1	-24.9
External Investment Income	35.0	100.5	3.9	1.4	-62.7
Public Net National Income	120.7	595.5	13.3	8.5	-35.9
Current Transfers from Abroad	239.5	1621.5	26.4	23.2	-12.0
Public Disposable Income	360.2	2217.0	39.7	31.8	-20.0
Public Consumption	307.3	1743.1	33.9	25.0	-26.3
Net Public Savings	52.9	473.9	5.8	6.8	16.4
c) NATIONAL			% of GDP @ MP		
NDP at Market Prices	868.3	6474.5	95.7	92.7	-3.1
Income from Investment: Net	35.0	22.3	3.9	0.3	-91.7
Workers' Remittances: Net	28.9	1626.0	3.2	23.3	631.3
Net Factor Income from Abroad	63.9	1648.3	7.0	23.6	235.3
Net National Income	932.2	8122.8	102.7	116.4	13.3
Net Current External Transf.	247.5	1692.8	27.3	24.2	-11.1
National Disposable Income	1179.7	9815.6	130.0	140.6	8.1
Net National Savings	96.3	1663.1	10.6	23.8	124.5
Gross National Savings	135.3	2169.4	14.9	31.1	108.4
Net Foreign Lending	-31.5	-477.2	-3.5	-6.8	96.9
III.S. FINANCING OF DOMESTIC INVESTMENT:-					
a) PRIVATE SECTOR			% of Priv.C.F.		
Net Domestic Savings	6.5	-429.9	6.8	-32.3	-575.9
Depreciation Allowances	37.5	324.8	39.1	24.4	-37.7
Net Workers' Remittances	28.9	1626.0	30.1	122.0	304.9
Net Investment Inc. from Abr.	0.0	-78.2	0.0	-5.9	..
Net Current Exter. Transfers	8.0	71.3	8.3	5.4	-35.9
Net Errors & Ommissions	3.9	-112.6	4.1	-8.4	-307.8
Gross National Savings	84.8	1401.4	88.4	105.2	18.9
Net Borrowing (- Lending)	11.1	-68.7	11.6	-5.2	-144.5
Gross Capital Formation	95.9	1332.7	100.0	100.0	********
b) GOVERNMENT SECTOR			% of Pub. C.F.		
Net Domestic Savings	-221.6	-1248.1	-312.6	-95.0	-69.6
Depreciation Allowances	1.5	181.5	2.1	13.8	552.9
Net Investment Inc. from Abr.	35.0	100.5	49.4	7.6	-84.5
Net Current Exter. Transfers	239.5	1621.5	337.8	123.4	-63.5
Gross National Savings	54.4	655.4	76.7	49.9	-35.0
Net Borrowing (- Lending)	16.5	658.5	23.3	50.1	115.4
Gross Capital Formation	70.9	1313.9	100.0	100.0	********
c) NATIONAL			% of Total C.F.		
Net Domestic Savings	-215.1	-1678.0	-129.0	-63.4	-50.8
Depreciation Allowances	39.0	506.3	23.4	19.1	-18.2
Net Workers' Remittances	28.9	1626.0	17.3	61.4	254.6
Net Investment Inc. from Abr.	35.0	22.3	21.0	0.8	-96.0
Private External Transf.+E&O.	11.9	-41.3	7.1	-1.6	-121.9
Public External Transfers	239.5	1621.5	143.6	61.3	-57.3
Gross National Savings	139.2	2056.8	83.5	77.7	-6.9
Net Borrowing (- Lending)	27.6	589.8	16.5	22.3	34.7
Gross Capital Formation	166.8	2646.6	100.0	100.0	********

Table (2) Basis for System of Notation. (p.1 of 2 pages)

Place	Symbol	Standing for
First Place:-		
	D	Dummy Variables
	E	External
	F	Rest of the World (Foreign) Sector
	G	Government (Public) Sector
	H	Private (Household) Sector
	I	Domestic Economy (Government & Private)
	S	Domestic Production Sectors
	***	For Transfers, Recepient Sector is in 1st Place
Second Place:-		
For E	G	Gulf & Iraq
	K	Stock variable (with T for Time)
	U	Euro Market (with R for Interest Rate)
For F	M	Exports of Goods & Services
For: G,H,I	K	Stock Variables (Capital, Labour)
	M	Imports of Goods & Services
	P	Domestic Production
	R	Receipts (of Income Types)
	S	Savings
	T	Taxes
	X	Domestic Expenditures
	***	For Transfers, Paying Sector as in 1st Place
For S	A	Agriculture, Forestry & Fishing
	B	Manufacturing Industries
	C	Construction
	D	Wholesale & Retail Trade, Restaurants & Hotels
	E	Electricity & Water Supply
	F	Financing, Real Estate & Business Services
	I	Imputed Bank Service Charges
	N	Net Finance Services
	P	Transport & Communication
	Q	Mining & Quarrying
	S	Other (Business, Domestic & Government) Services
Third Place:-		
For K	C	Bank Credit to Private Business, JD. m.
	E	Employment, Thousands
	K	End of Year Capital Stock
	L	Domestic Labour Force, Thousands
	M	Expatriate (Imported) Labour Force, Thousands
	P	Total Population, Thousands
	U	Unemployment, Thousands
For M	C	Imports of Consumers Goods
	F	Imports of Fuels
	G	Total Imports of Goods
	H	Imports of Intermediate & Miscellaneous Goods
	I	Imports of Intermediate Goods
	K	Imports of Capital Goods
	M	Imports of Miscellaneous Goods
	L	Imports of Travel Services
	O	Imports of Other (than Travel) Services
	P	Imports (Exports) of Phosphates
	S	Total Imports of Services
	T	Total Imports of Goods & Services
	U	Total Imports (Exports) Excluding Phosphate

Table (2) Basis for System of Notation, (p.2 of 2 pages)

Place	Symbol	Standing for
For P	P	Production of Phosphate
	R	Gross Domestic Production
For R	A	Adjusted (Private) Output
	D	Depreciation Allowances
	F	Net Receipts of Transfers from Abroad
	G	Net Receipts of External Receipts & Workers' Remittances
	I	Investment Income from Abroad, Net
	J	Net Operating Surpluses
	K	Gross Operating Surpluses
	L	Compensation of Employees
	N	National Income
	O	Net Errors & Ommissions
	P	Net Domestic Product at Factor Cost
	Q	Gross Domestic Product at Factor Cost
	R	Government Current Revenue
	S	Net Domestic Income at Market Price
	T	Gross Domestic Income at Market Price
	U	Total Factor Incomes from Abroad, Net
	V	Workers' Remittances, Credit
	W	Workers' Remittances, Net
	X	Net Receipts from Abroad
	Y	National Disposable Income
	Z	Domestic Disposable Income
For S	D	Domestic Savings, Gross
	E	Domestic Savings, Net
	F	Total Financial Resources for Capital Financing
	G	National Savings, Gross
	N	National Savings, Net
For T	E	Excise Duties
	M	Customs Duties
	N	Indirect Taxes Net of Subisdies
	O	Other Indirect Taxes, Net
	S	Subsidies
	Y	Income Tax
For X	C	Final Consumption
	E	Construction Component of GFCF
	F	Net Fixed Capital Formation
	G	Gross Fixed Capital Formation
	H	Change in Stocks
	L	Net Lending
For Sectors	A	Adjusted Value Added (Moving Average) for Agric.
	D	Deviation of Agriculture (Actual - Adjusted
	E	Employment (total: Jordanian & Others) per Sector
	V	Sectorial Value Added
Fourth Place:-		
	N	Series in constant (1985) prices
	P	Price deflators, 1985 = 100
	Q	Series in Physical Units
	R	Series in current prices, or nominal terms
Fifth Place:-		
	&	To denote past values (lag one year)
	%	To denote change (current - past) values
	$	To denote natural logarithm of variable

Table (3) List of Variables (Order of Computation)

No.	Symbol	Variable
A)	Dummy Variables	
6	DAEQ	Dummy: Employment, Mining & Quarrying
7	DBVN	Dummy: Value Added Manufacturing
8	DCEQ	Dummy: Employment, Construction
9	DCVN	Dummy: Value Added, Construction
10	DDEQ	Dummy: Employment, Trade, Restaurants & Hotels
11	DDVN	Dummy: Value Added, Trade, Restaurants & Hotels
12	DEEQ	Dummy: Employment, Electricity & Water
13	DEVN	Dummy: Value Added, Electricity & Water
14	DFEQ	Dummy: Employment, Financial Services & Real Estate
15	DFMS	Dummy: Exports, Total Services
16	DFVN	Dummy: Value Added, Financial Services & Real Estate
17	DGHR	Dummy: Other Transfers from Private Sector to Government
18	DHGR	Dummy: Transfers from Government to Private Sector
19	DIVN	Dummy: Imputed Banking Charges
20	DKLQ	Dummy: Total Labour Force
21	DMCN	Dummy: Imports, Consumers Goods
22	DMHN	Dummy: Imports, Intermediate & Miscellaneous Goods
23	DMKN	Dummy: Imports, Capital Goods
24	DMOR	Dummy: Exports, Other (than Travel) Services
25	DMSN	Dummy: Imports, Total Services
26	DMUN	Dummy: Exports,Total Goods & Services, Excluding Phosphate
27	DPEQ	Dummy: Employment, Transport & Communications
28	DPVN	Dummy: Value Added, Transport & Communications
29	DQEQ	Dummy: Employment, Mining & Quarrying
30	DQVN	Dummy: Value Added, Mining & Quarrying
31	DRDN	Dummy: Total Depreciation Allowances
32	DRFR	Dummy: Government's Net Transfers from Abroad
33	DRIR	Dummy: Government's Net Investment Income from Abroad
34	DRLR	Dummy: Compensation of Employees
35	DRQN	Dummy: Nat.Log.; Gross Domestic Product at Factor Cost
36	DRWR	Dummy: Net Workers' Remittances
37	DRXR	Dummy: Private Sector's Net External Revenue
38	DSEQ	Dummy: Employment, Social Services
39	DSVN	Dummy: Value Added, Social Services
40	DTER	Dummy: Excise Duties
41	DTOR	Dummy: Other Indirect Taxes
42	DTSR	Dummy: Subsidies
43	DTYR	Dummy: Income Taxes
44	DXCN	Dummy: Household Consumption
45	DXCR	Dummy: Public Consumption
46	DXER	Dummy: Construction Component of GFCF
47	DXGN	Dummy: Private Gross Fixed Capital Formation
48	DXGR	Dummy: Public Gross Fixed Capital Formation
49	DXIN	Dummy: Intermediate Consumption
B)	Exogenous Variables	
50	EGTN	Gulf & Iraq, GDP at Market Price, Constant ($ Billion)
51	EGTP	Gulf & Iraq, GDP at Market Price, Deflator
52	EKTQ	Time Trend, 1966 = 0
53	EURR&	Past Euro Dollar Interest Rate, %
54	FMOP	Exports, Other Services, Deflator
55	FMPN	Exports, Phosphate, Constant
56	FMPP	Exports, Phosphate, Deflator
57	FMSP	Exports, Total Services, Deflator
58	FMUP	Exports, Total Goods & Services, Excluding Phosphate, Deflator

Table (3) Cont., (p. 2 of 5 pages)

No.	Symb.	Variable
		Exogenous Variables, Cont.
59	GHRP	Other Transfers from Private Sector to Government, Deflator
60	GRDR	Government's Depreciation Allowances, Current
61	GTEP	Excise Duties, Deflator
62	GTMP	Customs Duties, Deflator
63	GTOP	Other Indirect Taxes, Deflator
64	GTSP	Subsidies, Deflator
65	GTYP	Income Taxes, Deflator
66	GXCP	Public Consumption, Deflator
67	GXHR	Government's Change in Stocks, Current
68	HGRP	Transfers from Government to Private Sector, Deflator
69	HRIR	Private Net Investment Income from Abroad, Current
70	HRWP	Net Workers' Remittances, Deflator
71	HXCP	Private Consumption, Deflator
72	IKCN	Commercial Banks Credit to Private Sector, Constant
73	IKCN$	Nat.Log.; Bank Credit to Private Sector, Constant
74	IKMQ	Expatriate Labour Force, Thousands
75	IKPQ	Total Population, Thousands
76	IMCP	Imports, Consumers Goods, Deflator
77	IMFP	Imports, Fuels, Deflator
78	IMHP	Imports, Intermediate & Miscellaneous Goods, Deflator
79	IMKP	Imports, Capital Goods, Deflator
80	IMSP	Imports, Total Services, Deflator
81	IPPQ	Production, Potash, 10^5 Tons
82	IRDP	Depreciation Allowances, Deflator
83	IRFP	Net External Transfers, Deflator
84	IRIP	Net Investment Income from Abroad, Deflator
85	IROR	Net Errors & Ommissions, Current
86	IRQP	Gross Domestic Product at Factor Cost, Deflator
87	IXEP	Construction Component of Investment, Deflator
88	IXGP	Total Gross Fixed Capital Formation, Deflator
89	IXIP	Intermediate Consumption, Deflator
90	SADN	Adjustment Component, Agriculture, Constant
91	SPVP	Transport & Communications, Value Added, Deflator
		C) Derived Exogenous Variables)
92	EGTR	Gulf & Iraq GDP at Marke Price, Current
93	FMPR	Exports, Phosphates, Current
94	HRIN	Private Net Investment Income from Abroad, Constant
95	RMCC	Imports Consumers Goods Deflator/ Private Consumption Deflator
96	RMFI	Fuels Imports Deflator/ Intermediate Consumption Deflator
97	RMHI	Imports Interm.& Misc.Goods Deflator/Intermed.Consumpn. Deflator

Table (3) Cont., (p. 3 of 5 pages)

No.	Symbol	Variable
D)	Endogenous Variables	
98	SQVN	Value Added, Mining & Quarrying, Constant
99	SQEQ	Employment, Mining & Quarrying, Thousands
100	SIVN	Value Added, Imputed Banking Charges, Constant
101	SSVN	Value Added, Social Services, Constant
102	SSEQ	Employment, Social Services, Thousands
103	IRDN	Total Depreciation Allowances, Constant
104	IRDR	Total Depreciation Allowances, Current
105	HRDR	Private Depreciation Allowances, Current
106	GTER	Excise Duties, Current
107	GTEN	Excise Duties, Constant
108	GTSR	Subsidies, Current
109	GTSN	Subsidies, Constant
110	GRIR	Government's Net Investment Income from Abroad, Current
111	GRIN	Government's Net Investment Income from Abroad, Constant
112	HRWR	Net Workers' Remittances, Current
113	HRWN	Net Workers' Remittances, Constant
114	HRXR	Private Sector's Net External Revenue, Current
115	HRFR	Private Sector's Net External Transfers, Current
116	HRFN	Private Sector's Net External Transfers, Constant
117	HRGN	Private Sector's Foreign Receipts, Constant
118	HRXN	Private Sector's Net External Revenue, Constant
119	IKEQ	Total Employment, Thousands
120	IKEQ$	Nat.Log., Total Employment, Thousands
121	IKKN$	Nat.Log., Beginning-of-Year Capital Stock, Constant
122	IRQN$	Nat.Log., Gross Domestic Product at Factor Cost,Constant
123	IRQN	Gross Domestic Product at Factor Cost, Constant
124	IRQR	Gross Domestic Product at Factor Cost, Current
125	GTNR	Net Indirect Taxes, Current
126	GTNN	Net Indirect Taxes, Constant
127	IRTR	Gross Domestic Product at Market Price, Current
128	IRTN	Gross Domestic Product at Market Price, Constant
129	IRPR	Net Domestic Product at Factor Cost, Current
130	IRPN	Net Domestic Product at Factor Cost, Constant
131	IRPP	Net Domestic Product at Factor Cost, Deflator
132	IRLR	Compensation of Employees, Current
133	RRLP	Income Distribution: Wages Current/ N.D.P at Factor Cost,Current
134	IXIN	Intermediate Consumption, Constant
135	IPRN	Total Domestic Production, Constant
136	IXIR	Intermediate Consumption, Current
137	IPRR	Total Domestic Production, Current
138	GTYR	Income Taxes, Current
139	GTYN	Income Taxes, Constant
140	GHRR	Other Transfers from Private Sector to Government, Current
141	GHRN	Other Transfers from Private Sector to Government, Constant
142	HGRR	Transfers from Government to Private Sector, Current
143	HGRN	Transfers from Government to Private Sector, Constant
144	GRRR	Government's Domestic Revenue, Current
145	GRZR	Government's Domestic Disposable Income, Current
146	GRFR	Government's Net Transfers from Abroad, Current
147	GRFN	Government's Net Transfers from Abroad, Constant
148	GRXN	Government's Net External Revenue, Constant
149	HRYN	Private national Disposable Income, Constant
150	HRYR	Private national Disposable Income, Current
151	HRYP	Private national Disposable Income, Deflator
152	RXCY	Household Consumption Deflator/Househ.Disposable Income Deflator

Table (3) Cont., (p. 4 of 5 pages)

No.	Symbol	Variable
		Endogenous Variables, Cont.
153	HXCN	Household Consumption, Constant
154	HXCR	Private Consumption, Current
155	GXCR	Public Consumption, Current
156	GXCN	Public Consumption, Constant
157	GSGR	Government's Gross National Savings, Current
158	IXCN	Total Final Consumption, Constant
159	IXCR	Total Final Consumption, Current
160	IXCP	Total Final Consumption, Deflator
161	HRDN	Private Depreciation Allowances, Constant
162	HSGN	Private Gross National Savings, Constant
163	HSGR	Private Gross National Savings, Current
164	HSGP	Private Gross National Savings, Deflator
165	RXGG	Total GFCF Deflator/ Private National Gross Savings Deflator
166	IRAN	GDPFC,Less Mining,Electr.,Total Services, + Agric.Adjust.,Const.
167	HXGN	Private Gross Fixed Capital Formation, Constant
168	GXGR	Public Gross Fixed Capital Formation, Current
169	GXGN	Public Gross Fixed Capital Formation, Constant
170	IXGN	Gross Domestic Fixed Capital Formation, Constant
171	IKKN	End-of-Year Capital Stock, Constant
172	IXGR	Total Gross Fixed Capital Formation, Current
173	IXER	Construction Component of GFCF, Current
174	IXEN	Construction Component of GFCF, Constant
175	FMUN	Exports, Total Goods & Services, Excluding Phosphate, Constant
176	FMSN	Exports, Total Services, Constant
177	FMTN	Total Exports of Goods & Services, Constant
178	FMUR	Exports, Total Goods & Services, Excluding Phosphate, Current
179	FMSR	Exports, Total Srvices, Current
180	FMOR	Exports, Other (than Travel) Services, Current
181	FMON	Exports, Other (than Travel) Services, Constant
182	FMTR	Total Exports of Goods & Services, Current
183	IMCN	Imports, Consumers Goods, Constant
184	IMHN	Imports Intermediate & Miscellaneous Goods, Constant
185	RXGT	Total GFCF Deflator/Gross Domestic Product at Market Deflator
186	IMKN	Imports, Capital Goods, Constant
187	IMGN	Imports, Total Goods, Constant
188	GTMR	Customs Duties, Current
189	GTMN	Customs Duties, Constant
190	IMCR	Imports, Consumers Goods, Current
191	IMHR	Imports Intermediate & Miscellaneous Goods, Deflator
192	IMKR	Imports, Capital Goods, Current
193	IMGR	Imports, Total Goods, Current
194	IMGP	Imports, Total Goods, Deflator
195	RMSC	Imports Services Deflator / Total Consumption Deflator
196	IRXN	Total Foreign Receipts, Constant
197	IMSN	Imports, Total Services, Constant
198	IMSR	Imports, Total Services, Current
199	IMTN	Total Imports of Goods & Services, Constant
200	IMTR	Total Imports of Goods & Services, Current
201	SBVN	Value Added Manufacturing, Constant
202	SEVN	Value Added, Electricity & Water, Constant
203	SCVN	Value Added, Construction, Constant
204	SPVN	Value Added, Transport and Communications, Constant
205	SDVN	Value Added, Trade, Restaurants & Hotels, Constant
206	SFVN	Value Added, Financial Services & Real Estate, Constant
207	SAVN	Value Added, Agriculture, Constant

Table (3) Cont., (p. 5 of 5 pages)

No.	Symbol	Variable
		Endogenous Variables, Cont.
208	SPVR	Value Added, Transport & Communications, Current
209	GTOR	Other Indirect Taxes, Current
210	GTON	Other Indirect Taxes, Constant
211	SAAN	Adjusted Value Added, Agriculture, Constant
212	SAEQ	Employment, Agriculture, Thousands
213	SBEQ	Employment, Manufacturing, Thousands
214	SEEQ	Employment, Electricity & Water, Thousands
215	SCEQ	Employment, Construction, Thousands
216	SPEQ	Employment, Transport & Communications, Thousands
217	SDEQ	Employment, Trade, Restaurants & Hotels, Thousands
218	SFEQ	Employment, Financial Services & Real Estate, Thousands
219	IKLQ	Total Labour Force, Thousands
220	IKUQ	Unemployment, Thousands
221	IXHN	Total Change of Stocks, Constant
222	IXHR	Total Change of Stocks, Current
223	GXLR	Government's Net Lending, Current
224	HXLR	Private Net Lending
225	IXLR	Total Net Lending
		E) Lagged Exogenous Variables
72	IKCN&	Past Commercial Banks' Credit to Private Sector, Constant
86	IRQP&	Past Gross Domestic Product at Factor Cost, Deflator
89	IXIP&	Past Intermediate Consumption Deflator
90	SADN&	Past Agriculture Adjstment Component, Constant
		F) Lagged Endogenous Variables
92	EGTR&	Past Gulf (& Iraq) GDP, Current
99	SQEQ&	Past Employment, Mining & Quarrying, Thousands
100	SIVN&	Past Imputed Bank Charges, Constant
101	SSVN&	Past Social Services Value Added, Constant
103	IRDN&	Past Total Depreciation Allowances, Constant
106	GTER&	Past Excise Taxes, Current
108	GTSR&	Past Subsidies, Current
117	HRGN*	Past Private Foreign Receipts, Constant
131	IRPP&	Past Net Domestic Product at Factor Cost, Deflator
137	IPRR&	Past Total Domestic Production, Current
146	GRFR&	Past Government's Net Transfers from Abroad, Current
158	IXCN&	Past Total Final Consumption, Constant
166	IRAN&	Past Adjusted Non-Public GDPFC, Constant
171	IKKN&	Beginning-of-Year Capital Stock, Constant
181	FMON&	Past Exports Other Services, Constant
188	GTMR&	Past Customs Duties, Current
202	SEVN&	Past Electricity & Water Value Added, Constant
203	SCVN&	Past Value Added, Construction, Constant
212	SAEQ&	Past Employment, Agriculture, Thousands
214	SEEQ&	Past Employment, Electricity & Water, Thousands
216	SPEQ&	Past Employment, Transport & Communications, Thousands
217	SDEQ&	Past Employment, Trade, Restaurants & Hotels, Thousands
218	SFEQ&	Past Employment, Financial Services & Real Estate, Thousands

Table (4) List of Variables (Alphabetic Order)

No.	Symbol	Variable
6	DAEQ	Dummy: Employment, Mining & Quarrying
7	DBVN	Dummy: Value Added Manufacturing
8	DCEQ	Dummy: Employment, Construction
9	DCVN	Dummy: Value Added, Construction
10	DDEQ	Dummy: Employment, Trade, Restaurants & Hotels
11	DDVN	Dummy: Value Added, Trade, Restaurants & Hotels
12	DEEQ	Dummy: Employment, Electricity & Water
13	DEVN	Dummy: Value Added, Electricity & Water
14	DFEQ	Dummy: Employment, Financial Services & Real Estate
15	DFMS	Dummy: Exports, Total Services
16	DFVN	Dummy: Value Added, Financial Services & Real Estate
17	DGHR	Dummy: Other Transfers from Private Sector to Government
18	DHGR	Dummy: Transfers from Government to Private Sector
19	DIVN	Dummy: Imputed Banking Charges
20	DKLQ	Dummy: Total Labour Force
21	DMCN	Dummy: Imports, Consumers Goods
22	DMHN	Dummy: Imports, Intermediate & Miscellaneous Goods
23	DMKN	Dummy: Imports, Capital Goods
24	DMOR	Dummy: Exports, Other (than Travel) Services
25	DMSN	Dummy: Imports, Total Services
26	DMUN	Dummy: Exports,Total Goods & Services, Excluding Phosphate
27	DPEQ	Dummy: Employment, Transport & Communications
28	DPVN	Dummy: Value Added, Transport & Communications
29	DQEQ	Dummy: Employment, Mining & Quarrying
30	DQVN	Dummy: Value Added, Mining & Quarrying
31	DRDN	Dummy: Total Depreciation Allowances
32	DRFR	Dummy: Government's Net Transfers from Abroad
33	DRIR	Dummy: Government's Net Investment Income from Abroad
34	DRLR	Dummy: Compensation of Employees
35	DRQN	Dummy: Nat.Log.; Gross Domestic Product at Factor Cost
36	DRWR	Dummy: Net Workers' Remittances
37	DRXR	Dummy: Private Sector's Net External Revenue
38	DSEQ	Dummy: Employment, Social Services
39	DSVN	Dummy: Value Added, Social Services
40	DTER	Dummy: Excise Duties
41	DTOR	Dummy: Other Indirect Taxes
42	DTSR	Dummy: Subsidies
43	DTYR	Dummy: Income Taxes
44	DXCN	Dummy: Household Consumption
45	DXCR	Dummy: Public Consumption
46	DXER	Dummy: Construction Component of GFCF
47	DXGN	Dummy: Private Gross Fixed Capital Formation
48	DXGR	Dummy: Public Gross Fixed Capital Formation
49	DXIN	Dummy: Intermediate Consumption
50	EGTN	Gulf & Iraq, GDP at Market Price, Constant ($ Billion)
51	EGTP	Gulf & Iraq, GDP at Market Price, Deflator
92	EGTR	Gulf & Iraq GDP at Marke Price, Current
92	EGTR&	Past Gulf (& Iraq) GDP, Current
52	EKTQ	Time Trend, 1966 = 0
53	EURR&	Past Euro Dollar Interest Rate, %
181	FMON	Exports, Other (than Travel) Services, Constant
181	FMON&	Past Exports Other Services, Constant
54	FMOP	Exports, Other Services, Deflator
180	FMOR	Exports, Other (than Travel) Services, Current
55	FMPN	Exports, Phosphate, Constant
56	FMPP	Exports, Phosphate, Deflator

Table (4) Cont., (p. 2 of 5 pages)

No.	Symbol	Variable
93	FMPR	Exports, Phosphates, Current
176	FMSN	Exports, Total Services, Constant
57	FMSP	Exports, Total Services, Deflator
179	FMSR	Exports, Total Srvices, Current
177	FMTN	Total Exports of Goods & Services, Constant
182	FMTR	Total Exports of Goods & Services, Current
175	FMUN	Exports, Total Goods & Services, Excluding Phosphate, Constant
58	FMUP	Exports, Total Goods & Services, Excluding Phosphate, Deflator
178	FMUR	Exports, Total Goods & Services, Excluding Phosphate, Current
141	GHRN	Other Transfers from Private Sector to Government, Constant
59	GHRP	Other Transfers from Private Sector to Government, Deflator
140	GHRR	Other Transfers from Private Sector to Government, Current
60	GRDR	Government's Depreciation Allowances, Current
147	GRFN	Government's Net Transfers from Abroad, Constant
146	GRFR	Government's Net Transfers from Abroad, Current
146	GRFR&	Past Government's Net Transfers from Abroad, Current
111	GRIN	Government's Net Investment Income from Abroad, Constant
110	GRIR	Government's Net Investment Income from Abroad, Current
144	GRRR	Government's Domestic Revenue, Current
148	GRXN	Government's Net External Revenue, Constant
145	GRZR	Government's Domestic Disposable Income, Current
157	GSGR	Government's Gross National Savings, Current
107	GTEN	Excise Duties, Constant
61	GTEP	Excise Duties, Deflator
106	GTER	Excise Duties, Current
106	GTER&	Past Excise Taxes, Current
189	GTMN	Customs Duties, Constant
62	GTMP	Customs Duties, Deflator
188	GTMR	Customs Duties, Current
188	GTMR&	Past Customs Duties, Current
126	GTNN	Net Indirect Taxes, Constant
125	GTNR	Net Indirect Taxes, Current
210	GTON	Other Indirect Taxes, Constant
63	GTOP	Other Indirect Taxes, Deflator
209	GTOR	Other Indirect Taxes, Current
109	GTSN	Subsidies, Constant
64	GTSP	Subsidies, Deflator
108	GTSR	Subsidies, Current
108	GTSR&	Past Subsidies, Current
139	GTYN	Income Taxes, Constant
65	GTYP	Income Taxes, Deflator
138	GTYR	Income Taxes, Current
156	GXCN	Public Consumption, Constant
66	GXCP	Public Consumption, Deflator
155	GXCR	Public Consumption, Current
169	GXGN	Public Gross Fixed Capital Formation, Constant
168	GXGR	Public Gross Fixed Capital Formation, Current
67	GXHR	Government's Change in Stocks, Current
223	GXLR	Government's Net Lending, Current
143	HGRN	Transfers from Government to Private Sector, Constant
68	HGRP	Transfers from Government to Private Sector, Deflator
142	HGRR	Transfers from Government to Private Sector, Current
161	HRDN	Private Depreciation Allowances, Constant
105	HRDR	Private Depreciation Allowances, Current
116	HRFN	Private Sector's Net External Transfers, Constant
115	HRFR	Private Sector's Net External Transfers, Current

Table (4) Cont., (p. 3 of 5 pages)

No.	Symbol	Variable
117	HRGN	Private Sector's Foreign Receipts, Constant
117	HRGN&	Past Private Foreign Receipts, Constant
94	HRIN	Private Net Investment Income from Abroad, Constant
69	HRIR	Private Net Investment Income from Abroad, Current
113	HRWN	Net Workers' Remittances, Constant
70	HRWP	Net Workers' Remittances, Deflator
112	HRWR	Net Workers' Remittances, Current
118	HRXN	Private Sector's Net External Revenue, Constant
114	HRXR	Private Sector's Net External Revenue, Current
149	HRYN	Private national Disposable Income, Constant
151	HRYP	Private national Disposable Income, Deflator
150	HRYR	Private national Disposable Income, Current
162	HSGN	Private Gross National Savings, Constant
164	HSGP	Private Gross National Savings, Deflator
163	HSGR	Private Gross National Savings, Current
153	HXCN	Household Consumption, Constant
71	HXCP	Private Consumption, Deflator
154	HXCR	Private Consumption, Current
167	HXGN	Private Gross Fixed Capital Formation, Constant
224	HXLR	Private Net Lending
72	IKCN	Commercial Banks Credit to Private Sector, Constant
72	IKCN&	Past Commercial Banks' Credit to Private Sector, Constant
73	IKCN$	Nat.Log.; Bank Credit to Private Sector, Constant
119	IKEQ	Total Employment, Thousands
120	IKEQ$	Nat.Log., Total Employment, Thousands
171	IKKN	End-of-Year Capital Stock, Constant
171	IKKN&	Beginning-of-Year Capital Stock, Constant
121	IKKN$	Nat.Log., Beginning-of-Year Capital Stock, Constant
219	IKLQ	Total Labour Force, Thousands
74	IKMQ	Expatriate Labour Force, Thousands
75	IKPQ	Total Population, Thousands
220	IKUQ	Unemployment, Thousands
183	IMCN	Imports, Consumers Goods, Constant
76	IMCP	Imports, Consumers Goods, Deflator
190	IMCR	Imports, Consumers Goods, Current
77	IMFP	Imports, Fuels, Deflator
187	IMGN	Imports, Total Goods, Constant
194	IMGP	Imports, Total Goods, Deflator
193	IMGR	Imports, Total Goods, Current
184	IMHN	Imports Intermediate & Miscellaneous Goods, Constant
78	IMHP	Imports, Intermediate & Miscellaneous Goods, Deflator
191	IMHR	Imports Intermediate & Miscellaneous Goods, Deflator
186	IMKN	Imports, Capital Goods, Constant
79	IMKP	Imports, Capital Goods, Deflator
192	IMKR	Imports, Capital Goods, Current
197	IMSN	Imports, Total Services, Constant
80	IMSP	Imports, Total Services, Deflator
198	IMSR	Imports, Total Services, Current
199	IMTN	Total Imports of Goods & Services, Constant
200	IMTR	Total Imports of Goods & Services, Current
81	IPPQ	Production, Potash, 10^5 Tons
135	IPRN	Total Domestic Production, Constant
137	IPRR	Total Domestic Production, Current
137	IPRR&	Past Total Domestic Production, Current
166	IRAN	GDPFC,Less Mining,Electr.,Total Services, + Agric.Adjust.,Const.
166	IRAN&	Past Adjusted Non-Public GDPFC, Constant

Table (4) Cont., (p. 4 of 5 pages)

No.	Symbol	Variable
103	IRDN	Total Depreciation Allowances, Constant
103	IRDN&	Past Total Depreciation Allowances, Constant
82	IRDP	Depreciation Allowances, Deflator
104	IRDR	Total Depreciation Allowances, Current
83	IRFP	Net External Transfers, Deflator
84	IRIP	Net Investment Income from Abroad, Deflator
132	IRLR	Compensation of Employees, Current
85	IROR	Net Errors & Ommissions, Current
130	IRPN	Net Domestic Product at Factor Cost, Constant
131	IRPP	Net Domestic Product at Factor Cost, Deflator
131	IRPP&	Past Net Domestic Product at Factor Cost, Deflator
129	IRPR	Net Domestic Product at Factor Cost, Current
123	IRQN	Gross Domestic Product at Factor Cost, Constant
122	IRQN$	Nat.Log., Gross Domestic Product at Factor Cost,Constant
86	IRQP	Gross Domestic Product at Factor Cost, Deflator
86	IRQP&	Past Gross Domestic Product at Factor Cost, Deflator
124	IRQR	Gross Domestic Product at Factor Cost, Current
128	IRTN	Gross Domestic Product at Market Price, Constant
127	IRTR	Gross Domestic Product at Market Price, Current
196	IRXN	Total Foreign Receipts, Constant
158	IXCN	Total Final Consumption, Constant
158	IXCN&	Past Total Final Consumption, Constant
160	IXCP	Total Final Consumption, Deflator
159	IXCR	Total Final Consumption, Current
174	IXEN	Construction Component of GFCF, Constant
87	IXEP	Construction Component of Investment, Deflator
173	IXER	Construction Component of GFCF, Current
170	IXGN	Gross Domestic Fixed Capital Formation, Constant
88	IXGP	Total Gross Fixed Capital Formation, Deflator
172	IXGR	Total Gross Fixed Capital Formation, Current
221	IXHN	Total Change of Stocks, Constant
222	IXHR	Total Change of Stocks, Current
134	IXIN	Intermediate Consumption, Constant
89	IXIP	Intermediate Consumption, Deflator
89	IXIP&	Past Intermediate Consumption Deflator
136	IXIR	Intermediate Consumption, Current
225	IXLR	Total Net Lending
95	RMCC	Imports Consumers Goods Deflator/ Private Consumption Deflator
96	RMFI	Fuels Imports Deflator/ Intermediate Consumption Deflator
97	RMHI	Imports Interm.& Misc.Goods Deflator/Intermed.Consumpn. Deflator
195	RMSC	Imports Services Deflator / Total Consumption Deflator
133	RRLP	Income Distribution: Wages Current/ N.D.P at Factor Cost,Current
152	RXCY	Household Consumption Deflator/Househ.Disposable Income Deflator
165	RXGG	Total GFCF Deflator/ Private National Gross Savings Deflator
185	RXGT	Total GFCF Deflator/Gross Domestic Product at Market Deflator
211	SAAN	Adjusted Value Added, Agriculture, Constant
90	SADN	Adjustment Component, Agriculture, Constant
90	SADN&	Past Agriculture Adjstment Component, Constant
212	SAEQ	Employment, Agriculture, Thousands
212	SAEQ&	Past Employment, Agriculture, Thousands
207	SAVN	Value Added, Agriculture, Constant
213	SBEQ	Employment, Manufacturing, Thousands
201	SBVN	Value Added Manufacturing, Constant
215	SCEQ	Employment, Construction, Thousands
203	SCVN	Value Added, Construction, Constant
203	SCVN&	Past Value Added, Construction, Constant

Table (4) Cont., (p. 5 of 5 pages)

No.	Symbol	Variable
217	SDEQ	Employment, Trade, Restaurants & Hotels, Thousands
217	SDEQ&	Past Employment, Trade, Restaurants & Hotels, Thousands
205	SDVN	Value Added, Trade, Restaurants & Hotels, Constant
214	SEEQ	Employment, Electricity & Water, Thousands
214	SEEQ&	Past Employment, Electricity & Water, Thousands
202	SEVN	Value Added, Electricity & Water, Constant
202	SEVN&	Past Electricity & Water Value Added, Constant
218	SFEQ	Employment, Financial Services & Real Estate, Thousands
218	SFEQ&	Past Employment, Financial Services & Real Estate, Thousands
206	SFVN	Value Added, Financial Services & Real Estate, Constant
100	SIVN	Value Added, Imputed Banking Charges, Constant
100	SIVN&	Past Imputed Bank Charges, Constant
216	SPEQ	Employment, Transport & Communications, Thousands
216	SPEQ&	Past Employment, Transport & Communications, Thousands
204	SPVN	Value Added, Transport and Communications, Constant
91	SPVP	Transport & Communications, Value Added, Deflator
208	SPVR	Value Added, Transport & Communications, Current
99	SQEQ	Employment, Mining & Quarrying, Thousands
99	SQEQ&	Past Employment, Mining & Quarrying, Thousands
98	SQVN	Value Added, Mining & Quarrying, Constant
102	SSEQ	Employment, Social Services, Thousands
101	SSVN	Value Added, Social Services, Constant
101	SSVN&	Past Social Services Value Added, Constant

No.	Symbol	Formula
	Derived Exogenous Variables	
92	EGTR	EGTN/EGTP*100
93	FMPR	FMPN*FMPP/100
94	HRIN	HRIR/IRIP*100
95	RMCC	IMCP/HXCP*100
96	RMFI	IMFP/IXIP*100
97	RMHI	IMHP/IXIP*100
	Endogenous Variables	
98	SQVN	F [FMPN,IPPQ,SCVN&, DQVN]
99	SQEQ	F [SQVN,SQEQ&, DQEQ]
100	SIVN	F [IKCN,SIVN&, DIVN]
101	SSVN	F [IXCN,SSVN&, DSVN]
102	SSEQ	F [SSVN,EKTQ,DSEQ]
103	IRDN	F [IKKN&, IRDN&, DRDN]
104	IRDR	IRDP*IRDN/100
105	HRDR	IRDR-GRDR
106	GTER	F [IPRR&, GTER&, DTER]
107	GTEN	GTER/GTEP*100
108	GTSR	F [RMFI,IXIP%, GTSR&, DTSR]
109	GTSN	GTSR/GTSP*100
110	GRIR	F [EURR&, DRIR]
111	GRIN	GRIR/IRIP*100
112	HRWR	F [EGTR&, DRWR]
113	HRWN	HRWR/HRWP*100
114	HRXR	F [EGTR&, DRXR]
115	HRFR	HRXR-HRIR-HRWR
116	HRFN	HRFR/IRFP*100
117	HRGN	HRWN+HRFN
118	HRXN	HRIN+HRGN
119	IKEQ	SAEQ+SQEQ+SBEQ+SEEQ+SCEQ+SPEQ+SDEQ+SFEQ+SSEQ
120	IKEQ$	Ln(IKEQ)
121	IKKN$	Ln(IKKN&)
122	IRQN$	F [IKEQ$, IKKN$, IKCN$, EKTQ,DRQN]
123	IRQN	Exp(IRQN$)
124	IRQR	IRQP*IRQN/100
125	GTNR	GTER+GTMR+GTOR-GTSR
126	GTNN	GTEN+GTMN+GTON-GTSN
127	IRTR	IRQR+GTNR
128	IRTN	IRQN+GTNN
129	IRPR	IRQR-IRDR
130	IRPN	IRQN-IRDN
131	IRPP	IRPR/IRPN*100
132	IRLR	F [IRPR,IRPP%, DRLR]
133	RRLP	IRLR/IRPR*100
134	IXIN	F [IRQN,DXIN]
135	IPRN	IRTN+IRXN
136	IXIR	IXIN*IXIP/100
137	IPRR	IRTR+IXIR
138	GTYR	F [IRQR,DTYR]
139	GTYN	GTYR/GTYP*100
140	GHRR	F [IRTR,DGHR]
141	GHRN	GHRR/GHRP*100
142	HGRR	F [IRTR,RRLP,DHGR]

No.	Symbol	Formula
143	HGRN	HGRR/HGRP*100
144	GRRR	GTER+GTMR+GTOR+GTYR+GHRR+GRDR
145	GRZR	GRRR-GTSR-HGRR-GRDR
146	GRFR	F [GRZR,EGTR,DRFR]
147	GRFN	GRFR/IRFP*100
148	GRXN	GRIN+GRFN
149	HRYN	IRPN+HGRN-GHRN-GTYN+HRXN
150	HRYR	IRPR+HGRR-GHRR-GTYR+HRXR
151	HRYP	HRYR/HRYN*100
152	RXCY	HXCP/HRYP*100
153	HXCN	F [HRYN,RRLP,RXCY,DXCN]
154	HXCR	HXCN*HXCP/100
155	GXCR	F [GRRR,GRFR%, DXCR]
156	GXCN	GXCR/GXCP*100
157	GSGR	GRZR+GRDR+GRIR+GRFR-GXCR
158	IXCN	HXCN+GXCN
159	IXCR	HXCR+GXCR
160	IXCP	IXCR/IXCN*100
161	HRDN	HRDR/IRDP*100
162	HSGN	HRYN+HRDN-HXCN
163	HSGR	HRYR+HRDR-HXCR
164	HSGP	HSGR/HSGR*100
165	RXGG	IXGP/HSGP*100
166	IRAN	IRQN-SADN-SQVN-SEVN-SSVN
167	HXGN	F [HSGR,RXGG,IRAN%, DXGN]
168	GXGR	F [GRRR,DXGR]
169	GXGN	GXGR/IXGP*100
170	IXGN	HXGN+GXGN
171	IKKN	IKKN#+IXGN-IRDN
172	IXGR	IXGN/IXGP*100
173	IXER	F [IXGR,DXER]
174	IXEN	IXER/IXEP*100
175	FMUN	F [IRTN,EGTN,SADN&, DMUN]
176	FMSN	F [IRTN,EGTN,DFMS]
177	FMTN	FMUN+FMFN
178	FMUR	FMUN*FMUP/100
179	FMSR	FMSN*FMSP/100
180	FMOR	F [IRTR,DMOR]
181	FMON	FMOR/FMOP*100
182	FMTR	FMUR+FMFR
183	IMCN	F [HXCN,HRGN,RMCC,DMCN]
184	IMHN	F [IPRN,RMHI,IKCN%, EKTQ,DMHN]
185	RXGT	IXGN/IRTN*100
186	IMKN	F [RXGT,HRGN&, DMKN]
187	IMGN	IMCN+IMHN+IMKN
188	GTMR	F [IMGN,GTMR&]
189	GTMN	GTMR/GTMP*100
190	IMCR	IMCN*IMCP/100
191	IMHR	IMHN*IMHP/100
192	IMKR	IMKN*IMKR/100
193	IMGR	IMCR+IMHR+IMKR
194	IMGP	IMGR/IMGN*100
195	RMSC	IMSP/IXCP*100
196	IRXN	HRXN+GRXN
197	IMSN	F [IXCN,IXCN%, IRXN,RMSC,DMSN]
198	IMSR	IMSN*IMSP/100

Table (5) Cont., (p.3 of 3 pages)

No.	Symbol	Formula
199	IMTN	IMGN+IMSN
200	IMTR	IMGR+IMSR
201	SBVN	F [HXCN,EKTQ,DBVN]
202	SEVN	F [SBVN,SEVN&, DEVN]
203	SCVN	F [IXEN,SCVN&, DCVN]
204	SPVN	F [IRTN,FMON&, DPVN]
205	SDVN	F [IRTN,IMGN,DDVN]
206	SFVN	F [HXCN,IKCN,DFVN]
207	SAVN	IRQN+SIVN-SQVN-SBVN-SEVN-SCVN-SPVN-SDVN-SFVN-SSVN
208	SPVR	SPVN*SPVP/100
209	GTOR	F [SPVR,IRQP%, IMGP,DTOR]
210	GTON	GTOR/GTDP*100
211	SAAN	SAVN-SADN
212	SAEQ	F [SAAN,SAEQ&, DAEQ]
213	SBEQ	F [SBVN,EKTQ]
214	SEEQ	F [SEVN,SEEQ&,DEEQ]
215	SCEQ	F [SCVN,EKTQ,DCEQ]
216	SPEQ	F [SPVN,SPEQ&, DPEQ]
217	SDEQ	F [SDVN,SDEQ&, DDEQ]
218	SFEQ	F [SFVN,SFEQ&, DFEQ]
219	IKLQ	F [IKPQ,EKTQ,DKLQ]
220	IKUQ	IKLQ+IKMQ-IKEQ
221	IXHN	IRTN+IMTN-IXCN-IXGN-FMTN
222	IXHR	IRTR-IMTR-IXCR-IXGR-FMTR
223	GXLR	GSGR-GXGR-GXHR
224	HXLR	HSGR-HXGN*IXGP/100-IXHR+GXHR+IROR
225	IXLR	HXLR+GXLR

(Table 6) S.E.L.S. Estimates of Equations (Alphabetic Order)

Regressor	ConsTerm	X(1)	X(2)	X(3)	X(4)	X(5)	Statistics	
(180)	Const.T.	IRTR	DMOR				6.00105	SEE
FMOR	-32.065	0.19598	19.8527				0.99651	ACD
		71.7652	7.76956				2.29728	D-W
(176)	Const.T.	IRTN	EGTN	DFMS			11.8992	SEE
FMSN	-146.90	0.22469	1.17511	39.4832			0.99568	ACD
		13.1130	15.2457	7.67936			2.03259	D-W
(175)	Const.T.	IRTN	EGTN	SADN&	DMUN		19.3038	SEE
FMUN	-226.05	0.47576	0.85888	0.85850	32.2565		0.99439	ACD
		16.9453	6.60441	2.60689	3.19335		1.97059	D-W
(140)	Const.T.	IRTR	DGHR				1.86302	SEE
GHRR	0.72023	0.03563	8.61101				0.99074	ACD
		41.6709	6.08039				1.81164	D-W
(146)	Const.T.	GRZR	EGTR	DRFR			15.3676	SEE
GRFR	41.5100	-0.8962	1.49200	67.4951			0.98672	ACD
		-4.7001	20.9626	8.59249			1.93537	D-W
(110)	Const.T.	EURR&	DRIR				1.54234	SEE
GRIR	-4.4923	1.61666	10.3506				0.95662	ACD
		14.9411	14.0877				2.09709	D-W
(106)	Const.T.	IPRR&	GTER&	DTER			1.17933	SEE
GTER	0.96876	0.00861	0.51460	-4.4741			0.99063	ACD
		8.93924	6.00472	-5.8289			1.91237	D-W
(188)	Const.T.	IMGN	GTMR&				3.15862	SEE
GTMR	-15.457	0.07033	0.47447				0.99486	ACD
		9.80033	7.96192				1.95769	D-W
(209)	Const.T.	SPVR	IRGP%	IMGP	DTOR		3.62538	SEE
GTOR	-23.421	0.16261	-1.2181	1.18236	-13.250		0.99159	ACD
		1.83981	-2.8481	7.55384	-5.6202		1.96355	D-W
(108)	Const.T.	RMFI	IXIP%	GTSR&	DTSR		3.71040	SEE
GTSR	-17.401	0.52749	0.45918	0.41044	38.7189		0.98643	ACD
		7.05711	2.42334	5.81376	10.9198		2.13208	D-W
(138)	Const.T.	IRGR	DTYR				0.53119	SEE
GTYR	-3.9471	0.04002	4.13940				0.99919	ACD
		143.720	12.6781				2.03227	D-W
(155)	Const.T.	GRRR	GRFR%	DXCR			6.13842	SEE
GXCR	34.5788	0.83648	0.20411	33.0012			0.99748	ACD
		84.1516	8.32609	7.63260			2.10346	D-W
(168)	Const.T.	GRRR	DXGR				8.31800	SEE
GXGR	-7.2286	0.66507	53.3047				0.99353	ACD
		48.2843	8.30402				2.00625	D-W
(142)	Const.T.	IRTR	RRLP	DHGR			6.59634	SEE
HGRR	-106.96	0.12299	2.05400	17.1860			0.99064	ACD
		27.3600	3.00025	3.43750			2.00805	D-W

(Table 6) Cont., (p. 2 of 4 pages)

Regressor	ConsTerm	X(1)	X(2)	X(3)	X(4)	X(5)	Statistics	
(112)	Const.T.	EGTR&	DRWR				9.92608	SEE
HRWR	-8.8131	1.23761	98.3770				0.99449	ACD
		48.7464	10.5320				1.89617	D-W
(114)	Const.T.	EGTR&	DRXR				8.34760	SEE
HRXR	-5.9829	1.29615	67.9841				0.99612	ACD
		62.6805	9.46735				1.96616	D-W
(153)	Const.T.	HRYN	RRLP	RXCY	DXCN		27.4258	SEE
HXCN	646.187	0.75948	8.97686	-9.7423	-122.00		0.99480	ACD
		33.2607	3.30433	-4.5245	-6.3195		1.80549	D-W
(167)	Const.T.	HSGR	RXGG	IRAN%	DXGN		8.77408	SEE
HXGN	168.279	0.60123	-1.2348	0.67129	54.9676		0.99272	ACD
		31.2561	-8.9110	9.05139	12.2259		2.21982	D-W
(219)	Const.T.	IKPQ	EKTQ	DKLQ			2.09143	SEE
IKLQ	201.438	0.06695	6.32795	-9.6924			0.99893	ACD
		5.56448	7.07101	-6.2689			1.83543	D-W
(183)	Const.T.	HXCN	HRGN	RMCC	DMCN		8.77744	SEE
IMCN	73.6771	0.18391	0.29131	-0.6064	13.5614		0.99456	ACD
		11.3466	7.18640	-4.4540	2.90722		1.90258	D-W
(184)	Const.T.	IPRN	RMHI	IKCN%	EKTQ	DMHN	7.10926	SEE
IMHN	179.577	0.09171	-2.3747	0.38182	10.4804	24.4739	0.99648	ACD
		15.2581	-12.662	5.64236	11.6745	10.6986	2.33278	D-W
(186)	Const.T.	RXGT	HRGN&	DMKN			11.0388	SEE
IMKN	-104.49	7.77622	0.37557	39.2679			0.99238	ACD
		15.6475	11.6611	6.37139			1.93187	D-W
(197)	Const.T.	IXCN	IXCN%	IRXN	RMOC	DMSN	10.1293	SEE
IMSN	119.246	0.22050	0.23622	0.26773	-2.9394	61.7302	0.99742	ACD
		18.5745	6.96416	12.6820	-16.223	14.5451	2.14729	D-W
(103)	Const.T.	IKKN&	IRDN&	DRDN			2.86407	SEE
IRDN	-25.610	0.01501	0.50444	9.05205			0.99459	ACD
		8.06670	7.08371	7.87604			1.99003	D-W
(132)	Const.T.	IRPR	IRPP%	DRLR			6.75995	SEE
IRLR	-4.0534	0.53617	-3.6640	33.6721			0.99909	ACD
		135.142	-8.3576	7.67556			2.03766	D-W
(122)	Const.T.	IKEQ$	IKKN$	IKCN$	EKTQ	DRQN	0.03269	SEE
IRQN$	-1.7917	0.4650	0.5350	0.27207	-0.0258	-0.1106	0.99246	ACD
				6.70143	-4.5465	-4.1317	2.07259	D-W
(173)	Const.T.	IXGR	DXER				6.15062	SEE
IXER	5.46340	0.59208	50.9937				0.99739	ACD
		82.4945	12.5211				1.91123	D-W
(134)	Const.T.	IRQN	DXIN				33.6518	SEE
IXIN	-175.80	1.22120	225.873				0.99306	ACD
		49.0554	13.7286				2.03641	D-W

(Table 6) Cont., (p. 3 of 4 pages)

Regressor	ConsTerm	X(1)	X(2)	X(3)	X(4)	X(5)	Statistics	
(212)	Const.T.	SAAN	SAEQ&	DAEQ			1.42559	SEE
SAEQ	11.9191	0.08249	0.71287	11.2564			0.96571	ACD
		4.60750	8.65115	10.5000			2.39278	D-W
(213)	Const.T.	SBVN	EKTQ				0.81205	SEE
SBEQ	16.8274	0.10340	0.80688				0.99346	ACD
		6.58030	5.38890				1.78829	D-W
(201)	Const.T.	HXCN	EKTQ	DBVN			4.94239	SEE
SBVN	-5.0932	0.08218	3.76393	14.7836			0.99150	ACD
		7.87060	5.36812	4.60729			2.13268	D-W
(215)	Const.T.	SCVN	EKTQ	DCEQ			2.45655	SEE
SCEQ	6.02609	0.13993	3.65415	11.1121			0.99191	ACD
		3.64609	13.1001	7.98167			1.98891	D-W
(203)	Const.T.	IXEN	SCVN&	DCVN			2.38620	SEE
SCVN	-2.6048	0.27108	0.39406	8.99294			0.99693	ACD
		21.0456	12.2669	10.1989			1.89027	W-D
(217)	Const.T.	SDVN	SDEQ&	DDEQ			0.47485	SEE
SDEQ	5.92170	0.02450	0.79940	5.07576			0.99605	ACD
		5.55339	61.1990	10.2393			2.08800	D-W
(205)	Const.T.	IRTN	IMGN	DDVN			4.38057	SES
SDVN	23.1905	0.11856	0.03517	-11.077			0.99419	ACD
		10.5879	2.85579	-2.4544			2.14062	D-W
(214)	Const.T.	SEVN	SEEQ&	DEEQ			0.12195	SEE
SEEQ	2.14295	0.06923	0.33621	-1.3499			0.99547	ACD
		6.80942	4.66394	-10.973			2.18641	D-W
(202)	Const.T.	SBVN	SEVN&	DEVN			0.29842	SEE
SEVN	-1.7646	0.04104	0.87703	1.67107			0.99896	ACD
		7.63927	24.9824	8.36422			1.96583	D-W
(218)	Const.T.	SFVN	SFEQ&	DFEQ			0.17517	SEE
SFEQ	2.01804	0.02413	0.39889	-0.8889			0.99195	ACD
		5.47132	4.42242	-6.7020			1.71466	D-W
(206)	Const.T.	HXCN	IKCN	DFVN			4.57701	SES
SFVN	37.5645	0.04170	0.05130	20.4900			0.98304	ACD
		4.05960	4.50730	6.15125			2.04427	D-W
(100)	Const.T.	IKCN	SIVN&	DIVN			0.75325	SEE
SIVN	-1.1499	0.00928	0.80828	2.76342			0.99227	ACD
		4.61190	7.66906	5.35681			2.15288	D-W
(216)	Const.T.	SPVN	SPEQ&	DPEQ			0.48256	SEE
SPEQ	2.48608	0.13362	0.59272	0.99712			0.99819	ACD
		10.7301	14.2858	2.90502			2.20260	D-W
(204)	Const.T.	IRTN	FMON&	DPVN			2.50895	SEE
SPVN	9.87744	0.06674	0.12086	11.9727			0.99530	ACD
		11.4658	5.27671	9.87621			2.13047	D-W

(Table 6) Cont., (p. 4 of 4 pages)

Regressor	ConsTerm	X(1)	X(2)	X(3)	X(4)	X(5)	Statistics	
(99)	Const.T.	SQVN	S0EQ&	D0EQ			0.12114	SEE
S0EQ	0.82494	0.03381	0.73424	-0.5370			0.99580	ACD
		4.51508	10.9280	-6.8077			2.16650	D-W
(98)	Const.T.	FMPN	IPP0	SCVN&	D0VN		1.22967	SEE
S0VN	0.72772	0.45909	1.49369	0.04850	2.95744		0.99229	ACD
		11.2292	8.24798	2.30982	4.90460		2.05480	D-W
(102)	Const.T.	SSVN	EKT0	DSE0			2.89713	SEE
SSE0	57.6583	0.07685	8.04663	11.8099			0.99629	ACD
		2.69509	25.5263	4.53263			1.83472	D-W
(101)	Const.T.	IXCN&	SSVN&	DSVN			5.65326	SEE
SSVN	35.0103	0.08016	0.44960	17.0261			0.99046	ACD
		9.01552	6.53288	7.14656			1.98626	D-W