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An Appraisal of
Saudi Arabia's
Growth Prospects

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INTRODUCTION

Almost ten years ago the presentation of the eleventh annual report of the Saudi Arabian Monetary Agency included this quotation from the Koran: "Verily, never will God change the condition of a people until they change it themselves." Throughout the third plan, more than in any of its precursors, it is this theme of change and responsive participation in change which is dominant as exemplified in the introductory statement of development philosophy: "strategic priority to structural change rather than to growth" and "the spontaneous response from society to the opportunities offered by development."¹

Although the weakening of oil markets in 1982 and the lowering of oil prices beginning in 1983 mean that Saudi Arabia's oil revenues will likely decline considerably in the near future, the country's relatively small population (about seven million) together with its vast foreign portfolio (at least \$ 100 billion) mean that the economy can continue to be considered one of capital surplus for the foreseeable future.

The purpose of this paper is to analyze major movements in the Saudi Arabian economy within the concept of a capital surplus developing economy and to suggest the necessary considerations — from a Saudi point of view — which must be taken into account in order to manage the oil based financial surplus. This task is accomplished by: (1) describing the relationship between growth, inflation and oil revenues in the Saudi Arabian economy, (2) developing a macroeconomic model of the economy and (3) forecasting under different assumptions as to the value of exogenous variables, likely growth paths open to the country during the 1980s and 1990s.

1. Quoted in Howar Bowen-Jones, "The Third Saudi Arabian Five-year Plan," the *Arab Gold Journal* (October 1981), p. 55.

The quantification and discussion of the key macro-economic relationships involved is undertaken below. Drawing on these structural relationships, an overall model of the economy is developed. The model is constructed so that it is capable of identifying the simultaneous interaction of these variables over time. Thus, it is able to determine, among other things, whether or not the economy will be close to the long run growth objectives articulated in the country's first three development plans. It should be noted in this regard that while there is a high degree of continuity in objectives in the country's development plans, shifts, in emphasis do give each plan a distinct character.

Overview of the Third Plan

The third plan departs from its predecessors² in several areas. Both the first and second plans targeted high growth rates in all sectors; this carried with it a policy of allowing relatively free importation of foreign labor to satisfy demand. The third plan is much more selective, opting for high growth in those areas Saudi planners feel have proven potential. Clearly implied in the plan is the country's major long term objective, that of containing and eventually reducing the size of the foreign labor force. In contrast to the second plan's emphasis on infrastructure development designed to increase the absorptive capacity of the economy, the emphasis of the new plan is largely on raising the efficient utilization of the labor force — domestic and foreign alike — in hydrocarbons (usually highly capital intensive) and other manufacturing industries (especially in the agricultural and mining sectors). As in the past the overall goal is to diversify the economic bases of the nation.

While the third five year plan is undoubtedly a more sophisticated document than either the first or second, nevertheless it does retain much of the character of a project's list, with its financial implications not completely³ worked out. Moreover, the plan seems to suffer from a

2. For a detailed description of these, see Robert E. Looney, **Saudi Arabia's Development Potential** (Lexington, Mass.: Lexington Books, 1982).

3. Paul Barker, **Saudi Arabia: The Development Dilemma** (London: the Economist Intelligence Unit, 1982), p. 36.

weakness noted in the previous ones, namely that although manpower, infrastructure and other obstacles to economic development are acknowledged, they are not included in the central projections. Undoubtedly, this is in part a reflection of the dichotomy between economic rationality and political experience that exists in the kingdom. In support of the third plan, it should be said that a detailed review and updating is planned after two years have elapsed and that the planners themselves are openly advocating "roll-over" planning on a year by year basis as a much more appropriate approach to development in the case of a rapidly changing and still largely uncharted economy like Saudi Arabia's.⁴

Specifically, with regard to the plan itself, three medium range objectives have been identified and targeted: the structural change of the economy, the achievement of participation and social welfare in development, and greater economic and administrative efficiency.

In the analysis that follows attention will be largely focused on the structural change aspect of the model. Here Saudi policies are linked to three areas of economic activity: oil and gas production; the expansion of productive sectors in agriculture, mining and industry; and the continued development of infrastructure.

Clearly the on going and primary goal of the government, that of economic diversification, requires development of the agricultural, industrial and mining sectors (Table 1). In the government view, the private sector can and ultimately should be responsible for the bulk of output in these sectors. The government envisions its role largely as a catalyst to private sector entrepreneurial activity and investment in these areas through its provision of information and research results, of a supportive financial framework and investment incentives, and through the provision of the required infrastructure. Given the government's commitment to free enterprise and market forces, a major objective of the country's development strategy is therefore the rapid displacement of government sector activity in GDP by that of the private sector.

4. Ibid.

TABLE 1
Growth Targets for Non-Oil Economy, 1980-1985
 (% growth a year)

	Employment	GDP	Productivity
Producing sectors			
Agriculture	-2.46	5.35	8.0
Other mining	6.07	9.78	3.5
Other manufacturing	9.52	18.83	8.5
Utilities	8.33	29.46	19.5
Construction	-5.77	-2.48	3.5
Sub-total	-1.48	2.18	3.7
Services			
Trade	1.80	8.42	6.5
Transport	5.05	12.93	7.5
Finance	5.18	7.29	2.0
Other services	0.94	2.95	2.0
Government	5.57	7.16	1.5
Sub-total	3.06	8.84	5.6
Non-oil economy	1.16	6.19	5.0

Source: EIU Special Report No. 116 Saudi Arabia: The Development Dilemma

In contrast to nearly all other third world development plans, if the third plan fails to achieve its targets in the time frame allotted, it will not be due to financial limitations. Instead, inflationary pressures and productivity lags will ultimately determine the plan's likely course and eventual attainment.

Excessive inflation has been acknowledged in the third plan as an area requiring constant government attention. Anti-inflationary policy during the second plan period included the introduction of subsidies on various items as housing and essential foods. In the upcoming five

years, the government intends to drastically reduce or even abolish these subsidies. Politically, this action will be possible only if the government can restrain expenditures and thereby keep inflation within acceptable bounds — 7 to 10 percent.

In many respects⁵ the quite short Subsection 3.5, "Inflation" in Chapter 3, "Strategy for the Third Plan," is the most illuminating single passage in the entire plan document, since within it is contained an appreciation of all the forces which have led to the current development formula. These include:

1. the gap between government financed demand on the one hand and the required supply of goods, services and labor on the other;
2. a steep rise in the level of government expenditure could generate serious inflationary pressures;
3. the danger depends not so much on the pressures of demand for goods and services as on that for skilled manpower;
4. outside the government there could be inflationary pressures arising from the private sector's own autonomous development; and
5. the rate at which imported inflation could affect the domestic cost and price levels remains subject to the efficiency of protective measures.

Each of these statements provides a valuable lead into the plan and the opportunities and problems which face the kingdom.

The third plan's development strategy largely revolves around rapid increases in productivity (Table 1). It is estimated that had not the second plan achieved the productivity increases it did, the labor force requirements would have been more than twice what they were. Similarly, the expected increase in productivity in the third plan would translate into 550,000 fewer workers needed—a figure of significance when compared to the 155,000 projected as required for the period. As the participation rate of the Saudis in the labor force has been declining slightly, the bulk of the workers who would be hired in the absence of in-

5. Bowen-Jones, *op. cit.*, p. 57

creased productivity would be foreign.⁶ It should be noted that the decline in Saudi participation is a direct result of the expansion of the kingdom's education and training programs.

Capital and skill intensive improvements and developments within each of the specific sectors will form the source for productivity growth. Despite continued outmigration of labor, agriculture is expected to contribute a significant amount to the country's productivity improvement. High productivity projects, financed with the aid of the Saudi Industrial Development Fund, provide the major impetus on which manufacturing is to achieve its targeted increases in productivity.

Macroeconomic Linkages

The estimated structural equations attempt to capture several of the more important linkages between government activity, economic growth and inflation.

Government spending (Table 2) has grown considerably over the last few years, with domestic spending fluctuating in part as a means of stabilizing the price level, as evidenced in public statements, and the fairly close relationship (Table 3) between government domestic spending and the net cash flows through government spending.

Imports have played a large role in reducing domestic inflationary pressure (Table 3). At the same time increases in world prices are directly transmitted into the domestic economy. For example in 1981 (1400/01) imports (CIF) of the non-oil private sector increased by 21 percent to Rls 101.6 billion. Adjusting these for the rise of 9.6 percent in dollar-based CIF import prices and for the appreciation of 1 percent in the exchange rate of the riyal against the dollar, the growth in real imports was about 11 percent. Consequent to the rise of 8.6 percent in riyal import prices and of 7.8 percent in the non-oil GDP deflator, the average cost of supplies rose by 8.3 percent.

6. Ragaei El Mallakh and Dorteia H. El Mallakh, "The Third Development Plan of Saudi Arabia, 1400-1405 A.H./1980-1985 A.D." in Ragaei El Mallakh and Dorteia H. El Mallakh, *Saudi Arabia: Energy, Developmental Planning, and Industrialization* (Lexington, Mass.: Lexington Books, 1982), pp. 187-188.

TABLE 2
SAUDI ARABIA: GOVERNMENT CASH—FLOW SPENDING, 1977 - 1981

(Billion Riyals)

	1977	1978	1979	1980	1981
1. Government Spending	128.3	138.0	145.0	188.4	236.6
2. Total Cash-Flow Spending	104.9	142.2	148.9	178.2	230.7
a. Direct Foreign Exchange Spending	39.6	43.9	46.0	43.3	73.8
b. Domestic Spending	65.3	98.3	102.9	134.9	156.9
3. Domestic Revenue	3.3	4.9	6.4	7.2	9.1
4. Net Cash-Flows through Government Spending	62.0	93.4	96.5	127.7	147.8
ANNUAL RATES OF GROWTH					
1. Government Spending	56.8	7.6	7.2	27.3	25.6
2. Total Cash-Flow Spending	59.8	35.6	4.7	31.1	16.3
a. Direct Foreign Exchange Spending	87.7	10.9	4.8	-5.9	70.4
b. Domestic Spending	46.7	50.5	4.7	31.1	16.3
3. Domestic Revenue	69.6	48.5	30.6	12.5	26.4
4. Net Cash-Flows through Government Spending	45.6	51.6	3.3	32.3	15.7

Source: Saudi Arabian Monetary Agency, Annual Report 1401 (1981).

TABLE 3
SAUDI ARABIA: TOTAL SUPPLIES, DEFLATORS, 1975 - 1981

(Billion Riyals)

	1975	1976	1977	1978	1979	1980	1981	Average Annual Growth 1975-1981
1. Total Supplies at Current Prices	41.7	70.8	105.1	142.8	171.4	214.2	258.6	35.5
a. Non-Oil GDP	28.1	47.3	67.7	89.9	107.2	129.9	157.0	33.2
b. Imports (CIF) of Non-Oil Private Sector	13.6	23.5	37.4	52.9	64.2	84.3	101.6	39.8
2. Total Supplies at 1970 Constant Prices	21.7	30.1	39.9	48.6	53.3	60.6	67.5	20.8
a. Non-Oil GDP (1a deflated by 3a)	12.6	15.1	17.7	20.2	22.5	25.2	28.2	14.4
b. Imports (CIF) of Non-Oil Private Sector (1b deflated by 3b)	9.1	15.0	22.2	28.4	30.8	35.4	39.3	27.6
2(b) as % of (2)	41.9	49.8	55.6	58.4	57.8	58.4	58.2	5.6
3. Deflators (1970 = 1.0)								
a. Non-Oil GDP Deflator	2.230	3.130	3.826	4.438	4.761	5.158	5.560	16.5
b. Riyal Import Price Deflator	1.489	1.565	1.680	1.865	2.084	2.382	2.586	9.6
c. Total Supplies Deflator	1.922	2.352	2.631	2.936	3.214	3.536	3.830	12.2
d. Cost of living Index	1.646	2.215	2.915	3.043	3.228	3.285	3.402	12.9

Source: Computed from Saudi Arabian Monetary Agency, Annual Report, various issues.

Note : Riyal import price deflator computed by adjusting the dollar based CIF import price index for any appreciation or depreciation in the riyal-dollar exchange rate.

However, the cost of living index is estimated to have risen by only 3.6 percent. This is because of a number of factors including the lower average of the basket of goods and services included in the cost of living index compared with that covered by both the non-oil GDP and imports, and the substantial weight in the index for rents, which have been declining, and a number of essential items subsidized by the government.

The government has been the major source of increased private sector liquidity (M3) (Tables 4-6). Of the gross liquidity pumped into the economy over the ten years, 94 percent came from government cash flows and only 6 percent from commercial bank credit. About 86 percent of these gross liquidity flows was absorbed by net private sector balance of payments deficit leaving a balance of 14 percent for increase in M3.

During the second plan period the government's share of gross liquidity flow was even higher (95 percent) and a greater proportion of these (87 percent) was absorbed by private sector balance of payments deficit. The government appreciates the fact that in an economy like that of Saudi Arabia, government domestic spending exercises a dominant influence on money supply growth. As noted when the inflationary pressures increase (Table 9) the government usually places primary reliance on fiscal policy.

Because of the strong link between government spending and the money supply, and given the freedom from all restrictions on foreign exchange transfers, the role of monetary policy has been limited in Saudi Arabia and major changes in monetary expansion have been brought about through the regulation of government spending. This role of fiscal policy will continue to be important even in the near future.⁷

7. "SAMA Prefers Keynes to Monetarists, "Saudi Arabia: A MEED Special Report (July 1981), p. 86.

TABLE 4
SAUDI ARABIA: FACTORS AFFECTING PRIVATE SECTOR LIQUIDITY,
FIRST AND SECOND PLAN PERIODS (1970 - 1980)

(Billion Riyals)

	(1970-1975)		(1975-1980)		Total	Plan I	Plan II	Total
	Plan I	Plan II	Plan I	Plan II				
1. Increase in Gross Private Sector Liquidity	43.9	445.8	489.7	100.0	100.0	100.0	100.0	100.0
a. Government Cash Flows	40.1	422.0	462.1	91.3	91.3	94.7	94.7	94.4
b. Government Bank Credit	3.8	23.8	27.6	8.7	8.7	5.3	5.3	5.6
2. Net Private Sector Balance of Payments Deficit	32.9	387.2	420.1	74.9	74.9	86.9	86.9	85.8
3. Increase in Private Sector Liquidity M3 (1 - 2)	11.0	58.6	69.6	25.1	25.1	13.1	13.1	14.2
a. Money M1	8.4	45.0	53.4	19.1	19.1	10.1	10.1	10.9
b. Quasi Money	2.6	13.6	16.2	5.9	5.9	3.1	3.1	3.1

Source: Saudi Arabian Monetary Agency, Annual Report 1400 (1980), p. 15.

TABLE 5
SAUDI ARABIA: FACTORS AFFECTING CHANGES IN M3

(Billion Riyals)

	1977	1978	1979	1980	1981
1. Gross Liquidity Flows	61.8	96.2	105.0	137.2	158.8
a. Cash Flows through Government Spending including Net Loans Disbursed by Government-sponsored Credit Institutions	61.9	93.4	96.5	127.7	147.8
b. Increase in Commercial Bank Claims on the Private Sector	-0.1	2.8	8.5	9.5	11.0
2. Private Sector Balance of Payments Deficit	-48.3	-84.7	-97.5	-127.1	-146.6
3. Other Items (Net)	-0.6	4.8	0.3	1.2	2.6
4. Increase in M3	12.9	16.3	7.8	11.3	14.8

Source: Saudi Arabian Monetary Agency, Annual Report 1401 (1981), p. 8.

TABLE 6
SAUDI ARABIA: MONEY SUPPLY AND REAL MONEY DEMAND, 1977 - 1981

(Average Annual Rate of Growth)

	1977	1978	1979	1980	1981
1. M3	52.7	43.6	14.5	18.4	20.4
2. Real Supplies of Goods and Services	30.6	21.8	9.7	13.6	11.5
3. Inflationary Gap	22.1	11.8	4.8	4.8	8.9
4. Non-Oil GDP Deflator	22.4	16.0	7.3	8.3	7.8
5. Import Price Index	4.9	11.0	11.7	14.3	8.6
6. Supply Deflator	11.7	11.6	9.5	10.0	8.3
7. Cost of Living Index	25.4	4.4	6.1	1.8	3.6

Source: Saudi Arabian Monetary Agency, Annual Report 1401 (1981), p. 6.

The above trends immediately raise the issue of whether from an institutional perspective Saudi policy makers have adequate tools to implement the goals of the third plan while at the same time achieving their aims of price stability, strong positive growth rates in the non-oil private sector, increased private fixed capital formation, moderate interest rates, a good supply domestic liquidity (to lubricate the kingdom's rapid economic expansion), and predictable — if not stable — riyal exchange rate.

Starting with the exchange rate SAMA prefers a predictable riyal, as this helps traders who might otherwise be exposed to fluctuations in the rate. SAMA's policy is to peg the riyal within a narrow trading band to the International Monetary Fund's Special Drawing Right (SDR). However, the monetary authorities also want to keep riyal movements under control. The SDR has recently been moving erratically because of the general turbulence of foreign exchange markets. As a result SAMA's policy of adjusting the riyal to new parities slowly, means that in the first half of 1981 reevaluations of exactly 100 points were made nearly every week.⁸ On the whole it appears that the authorities are in control of the riyal rate and that exchange policy *per se* should not limit the policy makers in striving to achieve the third plan's goals.

As noted above, fiscal policy is also hampered by planning commitments. The fiscal balance is heavily if not overwhelmingly influenced by the five year spending targets. These do not allow conventional fine tuning measures. Nevertheless, the way in which the funds are disbursed acts as a shorter term regulatory valve on private sector activity and consumption. Since the steep inflation of the 1970s, the finance ministry has imposed strict control over funds' allocation to spending departments. Delaying payments helps to prevent over-stimulation.

The government has shown it is prepared to cut spending programs to stop inflation. In the mid-1970s prices rose by nearly 50 percent a year and threatened to undermine the development strategy. Budget cuts with subsidies and special infrastructure programs helped reduce infla-

8. Ibid.

tionary pressures. These policies can be used again if the economy shows signs of running out of control. However, the option is becoming increasingly unattractive because of the private sector's continued dependence on the flow of public spending; i.e., tight fiscal policy could greatly hinder the continued development of many infant manufacturing industries which low cost government funds are helping to bring to maturity.

One feature of the Saudi economy is its negligible taxation, and thus limited means of regulating economic activity — particularly consumption. On the political side, any suggestion that government should attempt to take spending power out of the economy through higher taxes would likely be extremely unpopular.⁹

Constraints on using fiscal instruments places a greater burden on monetary policy as an economic stabilizer. As with fiscal policy, however, there are few instruments available. A major problem is that the government does not issue debt such as treasury bills. In part the absence of government debt stems from the fact that there is no need to borrow to finance government spending.¹⁰ More important is the fact that Sharia law does not allow interest payments.

This restriction prevents SAMA from using open market operations to drain liquidity from the banking system and rediscounting paper at penal interest rates to control bank lending. In effect two of the most powerful monetary tools available to most modern central banks cannot be used in Saudi Arabia.

SAMA exercises control through reserve requirements and through "moral suasion." As of mid-1981 the main regulations were:

1. a 7 percent reserve requirement on demand and savings deposits. This was relaxed from 15 percent in 1980 to help to relieve a liquidity shortage;
2. a ceiling on the deposit-to-capital ratio of 15 to 1; and

9. William Quaint, *Saudi Arabia in the 1980s: Foreign Policy, Security and Oil* (Washington: Brookings Institution, 1982), p. 42.

10. Ragaei El Mallakh, *Saudi Arabia: Push to Development* (Baltimore: Johns Hopkins Press, 1982), pp. 223-225.

3. the requirement that the equivalent of 25 percent of deposits must be held in liquid assets — deposits with SAMA, cash and callable loans.

Despite the shortage of policy instruments, the Saudi economy has performed exceptionally well in the past. The government has been able to contain inflation while at the same time the private sector appears to have had access to the credit it requires for continued expansion. If the third plan period does not encounter any major unforeseen shocks, the policy tools available to the authorities should prove adequate for manipulating the economy.

Macroeconomic Relationships

The macroeconomic model developed below is designed to examine the economy from the point of view of the resources and requirements associated with alternative growth scenarios. Ultimately within the framework of an optimal control program, it is capable of distinguishing the most efficient growth path to the end targets. The model's forecasts determine the non-oil income growth rate, the inflation rate and foreign workforce implications of alternative spending rates.

The model is based on the assumptions that:¹¹

1. only a limited number of exogenous variables determine all the kingdom's basic macro variables;
2. government expenditures follow a pattern (albeit at a higher level) similar to that over the 1960-79 period;
3. that there are no major alterations in world economic conditions during this period;
4. that the current world oil glut will continue throughout the Third Plan period (1981-85).

Also implicit in the model is the presumption that the public sector's role in Saudi Arabia will continue to increase in the third development

11. An earlier version was presented in Robert E. Looney, "Saudi Arabia's Economic Development Strategy: Alternative Crude oil Production Scenarios," NUPI NOTAT No. 203, Oslo, Norway, Norsk Utenrikspolitisk Institutt, 1980.

plan reflecting the government's commitment to long term structural change. Government involvement in the economy manifests itself in a greater provision of financial support and social services. It also involves more government intervention in every sector of the economy to ensure that the plan's aims are being fulfilled.

In short, the model assumes a constant infusion of government expenditures into the economy. Furthermore, that government financed demand in Saudi Arabia has its own rather special characteristics which are determined fundamentally by the nature of the national economy; i.e., that the economy will remain incapable of self-sustained growth without continuous government demand manipulation. In this regard, while a breakdown of the contribution to the GDP by the oil and non-oil sectors of the economy at the beginning and at the end of the third plan estimates that the value of the former in relation to the latter will decline from 165 percent to 130 percent, this grossly underestimates the importance of national revenue ultimately derived from the export sale of oil. IMF estimates of 92 percent of total revenues from oil exports, as against 8 percent from investment income in 1975, provide a more accurate order of magnitude that is unlikely to have changed significantly. The third plan statistics themselves indicate very clearly that if one isolates the reasonable autonomous producing, commercial and financial sectors in the GDP from those which are ultimately reliant on demand created by government oil revenues, the estimates of the proportional importance of the former are of the order of no more than 20 percent at the beginning and 25 percent at the end of the planning period.¹²

The econometric model used to depict the major economic forces at work in the economy was estimated (Table 7) by a two stage least squares estimation procedure with annual data over the period 1960-1979,¹³ its main features include:

1. seventeen real (constant 1970) national income accounting equations

12. Bowen-Jones, *op. cit.*, p. 58.

13. The estimation procedure is outlined in Bronwyn Hall and Robert E. Hall, *Time Series Processor, Version 3.5 User's Manual*, Stanford, California (mimeo), April 6, 1980.

- (equations 1-17) and three (equations 18-20) nominal monetary features;
2. a distinction between oil (equations 15) income (OGDPNP) and non-oil (equation 16) gross domestic product (NOXNP);
 3. the influence of government expenditures (Δ GENANP) equation 1), reflecting perhaps public-private competition for resources-crowding out of private consumption;
 4. the use of numerous dummy variables (D1...D5) to depict various structural changes occurring in the 1970s;
 5. a causal monetary link (equations 18-21) between government nominal expenditures (GENAN) government deposits in the banking system (SGD), reserve money (SRM), the money supply (M2), and inflation-the non-oil GDP deflator (NODF);
 6. the influence of world inflation (ICEUV) on the terms of trade (TT) and thus;
 7. a series of exogenous variables, oil price (OilP), and export unit values (EUV) depicting the slowdown in world oil demand, and;
 8. the Third Plan goal of reducing foreign work force-labor force (EMPT) set at an average annual growth of 1.16 percent per annum.

Forecast of the Third Plan Period (1980-1985)

Forecasts for the Third Plan Period were made by incorporating a linear programming routine with the model equation. Theoretically, the model then became capable of depicting the shape of the country's production possibilities surface for each of the Five Plan years. The shape of this surface was not fixed but instead was a function of: (1) expected demand patterns, (2) resource availability, (3) choice of techniques, (4) patterns of supply including import substitution, (5) income growth, and (6) relative prices of goods and factors. Because the future production possibilities were predicted by the economic model, the prediction then became a function of another factor: (7) the structure of the model itself and the assumptions related to the technique of solution.

The endogenous generation of future production possibility surfaces for any economy which can be used to predict alternative efficient pat-

TABLE 7
SAUDI ARABIA: KEYNESIAN FORECASTING MODEL

(Two Stage Least Squares Estimates)

(Real Variable Block)			
(1) Private Consumption (PCNP)	$= 0.67PCNPL + 0.30NOXNP - 0.44 \Delta GENANP + 0.068$	(4.74) (4.48) (-3.63) (0.21)	DW = 1.65; Se = 0.49
(2) Private Investment (IPP)	$= 0.11NOXNPL + 1.77D3 + 0.33$	(6.42) (8.57) (2.71)	DW = 1.75; Se = 0.23
(3) Government Consumption (GCNP)	$= 0.65GCNPL + 0.57IGP + 0.67$	(2.81) (2.23) (1.60)	DW = 2.46; Se = 0.89
(4) Change in Stocks (ISNP)	$= 0.44NOXNP - 0.21$	(2.95) (-1.18)	DW = 2.27; Se = 0.42
(5) Government Non-Oil Revenue (GNREVP)	$= 0.11NOXNP + 1.27D3 + 0.27$	(4.14) (3.62) (1.39)	DW = 1.84; Se = 0.37
(6) Government Oil Revenue (GOREVP)	$= 7.45VPE + 6.76TT + 25.27D3 - 6.61$	(2.62) (5.30) (9.87) (-4.35)	DW = 2.59; Se = 2.53
(7) Imports (ZNANP)	$= -2.84TINP + 2.01$	(-49.17) (4.97)	DW = 1.20; Se = 1.27
(8) Exports (EP)	$= 30.23VPE + 1.95OILP - 5.03$	(4.91) (5.44) (-1.60)	DW = 1.08; Se = 6.38
(9) Net Factor Payments (NFPP)	$= -0.032EP - 4.08$	(4.17) (-3.58)	DW = 0.49; Se = 3.47

(10) Private Savings (PSPP) = 0.80NOXNP - 2.06 (5.38) (-1.16)	DW = 2.10; Se = 4.18
(11) Government Savings (GSP) = 0.71GREVP - 1.01GENANP + 3.31 (6.83) (-3.31) (2.31)	DW = 0.78; Se = 4.37
(12) Investment in Oil Sector (IOP) = 0.34IOPL + 0.57CPP - 0.16	DW = 1.92; Se = 0.22
(13) SAMA Domestic Assets (SDAP) = -0.98NSFAP + 0.52GENANP - 1.71DS + 0.05 (-53.16) (4.02) (-2.41) (0.10)	DW = 1.19; Se = 0.85
(14) Monetary System Net Foreign Assets (NSFAP) = 3.15NOXNP - 9.36 (5.94) (-1.47)	DW = 0.60; Se = 14.93
(15) Oil Sector Gross Domestic Product (OGDPNP) = 16.70VPE + 15.84TT - 20.93D3 - 15.21 (2.73) (5.77) (-3.80) (-4.65)	DW = 1.69; Se = 5.45
(16) Non-Oil Gross Domestic Product (NOXNP) = 0.37KP + 0.059EMPT - 7.24 (15.40) (5.71) (-3.66)	DW = 2.67; Se = 6.57
(17) Gross Domestic Product (GDPNP) = 23.54VPE + 10.97TT - 6.66 (3.93) (4.97) (-2.73)	DW = 0.98; Se = 5.42
(Nominal-Monetary Block)	
(18) Government Deposits in Banking System (SGD) = 1.23GENAN + 7.96 (9.16) (1.16)	DW = 0.63; Se = 25.78
(19) Reserve Money (SRM) = 0.21GENAN + 0.076SGD + 1.21 (3.42) (2.63) (0.87)	DW = 1.24; Se = 5.06
(20) Money Supply (M2) = 0.80SRM + 0.26GENANL + 0.33 (17.67) (13.31) (1.01)	DW = 1.98; Se = 1.17

(21) Non-Oil GDP Deflator (NODF) = 0.035M2L + 0.096 Δ NOXNP + 0.12IGPL + 1.11D3 + 0.76
(3.29) (4.64) (1.90) (12.03) (17.61) DW = 1.92; Se = 0.09

(22) Gross Domestic Product Deflator (GDPDF) = 1.19CPI + 0.16OILP - 0.34
(10.44) (11.43) (-2.97) DW = 1.74; Se = 0.19

(23) Consumer Price Index (CPI) = 1.51EXCESSEL + 0.62D1 + 0.62
(8.15) (4.19) (8.31) DW = 1.19; Se = 0.22

- (24) Total Consumption (TCNP) = PCNP + GCNP
- (25) Total Investment (TINP) = IPP + IGP
- (26) Gross Capital Formation (GCF) = TINP + ISNP + IOP
- (27) Gross National Product (GNP) = GDPNP + NFPP
- (28) Total Savings (SNP) = GNP - TCNP
- (29) Domestic Resource Gap (SI) = SNP - GCF
- (30) External Resource Gap (EM) = EP + ZNANP + NFPP
- (31) Terms of Trade (TT) = EUV/ICEUV
- (32) Domestic Absorption (ABP) = TCNP + TINP
- (33) Excess Monetary Pressure (EXCESSE) = M2/ABP

(34) Government Investment (IGP) = Design Variable
(35) Crude Petroleum Production Index (CPP) 1970 = 1.00
(36) Oil Price (OILP) = \$30 per Barrel
(37) Volume Petroleum Exports (VPE) 1975 = 100.0
(38) Industrial Country Export Unit Value (ICEUV) 1970 = 100.0
(39) Labor Force (EMPT)
(40) Export Unit Value (EUV) 1970 = 100.0

terms of production and resource allocation requires the model to incorporate some degree of choice. The linear programming algorithm which solved a set of linear inequalities for a constrained maximum developed for this problem was characterized by its ability to choose among alternative activities.

For a programming model of this type, it seemed better to maximize a general welfare function subject to other more precise national goals (which were included in the system as constraints). If there is a conflict among goals, the general level of welfare and efficiency in the system are not ignored as the government concerns itself with the trade-off among policy objectives.

The objective of maximum non-oil GDP growth subject to inflation and foreign labor constraints was chosen mainly because it seemed to portray best the government's interest in the kingdom's long term socio-economic stability. It is important to note that global profit maximization is not the real objective of the country. Indeed, Saudi Arabia's foremost concern is with the economy's ability to generate real economic development in the domestic non-oil sector without dependence on foreign workers or disruption of valued social institutions.

These considerations were introduced into the model in their simplest form; i.e., given the goal of higher income growth, how fast can the kingdom's economic expansion occur while the country simultaneously reduces its dependence on foreign workers and contains the rate of domestic inflation? More specifically, the objective function is formally states as: what is the maximum rate of real non-oil gross domestic product that can take place without additional foreign workers entering the kingdom and the rate of domestic inflation rising above five percent? Put differently, what specific increases would occur in non-oil GDP and the various macroeconomic aggregates if the inflation and employment constraints were relaxed?

The main exogenous variables (Table 8) are: (1) employment (EMPT), (2) world inflation, (ICEUV), (3) export prices (EUV), and (4) crude petroleum exports (VPE).

TABLE 8
RATES OF GROWTH OF EXOGENOUS VARIABLES

Variable (Symbol)	Low	Medium	High	LP (optimum)
Employment (EMPT)	3.0	5.0	7.0	1.16
World Inflation (ICEUV)	3.0	5.0	7.0	5.0
Export Prices (EUV)	-2.0	1.0	3.0	1.0
Volume Petroleum exports (UPE)	-2.0	1.0	3.0	1.0

Forecasts of employment depend on the number of net Saudi workers entering the work force plus net immigration. High, low and medium forecasts were also set at 3.0, 5.0 and 7.0, respectively, for comparison with the Fifth Plan (LP) set at 1.16.

The volume and price of petroleum exports are forecast to increase at 1.0 per annum (with the high and low runs of -2.0 and 5.0, respectively, set for comparison basis).

Given these exogenous values, an ex ante prediction technique was used to forecast the time path of the endogenous variables. The lagged endogenous variables were intergrated beginning with the 1979 figures. The linear programming (optional) run was then performed using the employment (1.16) and world inflation (5 percent) constraints.

The model's results (Table 9) indicate that growth coupled with a sharp rise in the number of Saudis going through higher education and training will clearly put a strain on indigenous labor supplies. However, the Planning Ministry plans to keep the demand for extra labor to a minimum. Some 300,000 new civilian jobs will be created which will be filled by movements of labor from construction and agriculture, an increase in skilled expatriates and the local labor market.

TABLE 9
SAUDI ARABIA: MACROECONOMIC FORECASTS FOR THE THIRD PLAN PERIOD

	1980			1985				
	High	Medium	Low Optimum	High	Medium	Low Optimum		
PCNP	16.10	15.87	15.66	15.47	31.13	29.25	27.79	26.45
GCNP	12.55	12.54	12.55	12.53	17.91	17.42	17.00	17.43
TCNP	28.65	28.41	28.21	28.00	49.04	46.67	44.79	43.88
TINP (ex ante)	18.71	18.62	18.74	18.64	27.51	25.55	25.87	25.55
TINP (ex post)	21.63	21.44	20.90	21.08	38.87	33.11	30.97	31.62
SNP (ex ante)	22.11	19.74	20.72	19.77	33.97	26.35	24.84	24.34
SNP (ex post)	30.58	27.99	28.09	26.90	43.42	31.46	29.68	28.67
Domestic Gap (ex ante)	3.40	1.12	1.98	1.13	6.46	0.80	-1.03	-1.21
Domestic Gap (ex post)	8.95	6.55	7.09	5.82	4.55	-1.65	-1.29	-2.95
PINP	5.71	5.53	5.34	5.17	9.78	8.90	8.49	8.20
GINP	11.45	11.36	11.48	11.37	17.21	15.24	15.03	15.23
GENANP	24.00	23.90	24.03	23.90	35.12	32.66	32.91	32.66
NOXNP	26.60	25.90	24.86	24.59	49.36	45.60	42.81	40.27
OGDPNP	31.87	29.78	30.71	29.61	41.91	31.53	30.70	31.35
GDPNP	58.47	55.68	55.57	54.20	91.27	77.13	73.51	71.62
NFPD	0.76	0.72	0.72	0.70	1.19	1.00	0.96	0.93
GNPNP	59.23	56.40	56.29	54.90	92.46	78.13	74.47	72.55
External Gap (ex ante)	12.30	9.48	11.14	9.96	18.99	5.48	5.37	8.05
External Gap (ex post)	8.95	6.55	7.20	5.82	3.36	-2.65	-2.25	-3.88
ZNANP (ex ante)	42.37	42.37	41.96	41.60	66.68	62.74	61.46	59.86
ZNANP (ex post)	45.72	45.30	45.90	45.80	82.31	70.87	69.08	71.79
EP	53.91	53.13	52.38	50.92	85.67	68.22	66.83	67.91

The model indicates the plan's envisaged spending increases could aggravate inflation once more. Controlling inflation, however, will be more difficult in the Third Plan than in the Second when it was successfully combated by fiscal policy, administrative controls and encouragement of immigration from other Middle East countries and Asia.

The adverse effects of curbing government spending will be greater in the 1980s because of the dependence of a growing number of enterprises on low cost government finance and the business generated by public sector projects. A considerably larger bureaucracy using up scarce supplies of skilled Saudi manpower would be required to administer a comprehensive mix of wage and price controls.

In general, the forecast is optimistic concerning Saudi Arabia's ability to achieve the Third Plan's objectives. Failure to meet the plan targets would probably stem for the government's inability to manage the economy using traditional macroeconomic policy instruments, such as the level of government spending, rather than any particular constraint. In this respect the Kingdom is moving into a crucial state of its development where the drive to industrialize will become increasingly difficult to halt, divert and even manage.

Long Run Forecasts

The model is important primarily for short run simulations, but it can also be used for longer run forecasts. Dynamic forecasts for 1985 to 2000 were therefore also made under the same three assumptions for the endogenous variables used in the Third Plan forecast.

Seen in this long run context the results produced a number of interesting patterns including:

1. Over the period 1978-1900, real non-oil growth varies from a low of 10.7 in the low oil export forecast to 12.74 in the high oil export, unconstrained foreign labor case.

2. The rate of growth of capital formation is high in all three forecasts, not varying by more than a percent between the high and low forecasts.

3. Government investment rates of growth are considerably greater than public consumption growth in all forecasts.

4. Inflation is sensitive to the rate of growth varying (again over the 1978-1990 period) from 10.34 in the low forecast to 13.04 in the high forecast.

5. Private expenditure grows at a somewhat slower rate than public expenditure with private consumption growth greatly exceeding the growth in private sector investment.

6. The growth in money is nearly in line with non-oil income.

7. The ex ante savings gap dominates the trade gap for all forecasts with the gaps tending to increase at lower rates of growth.

8. The trade gap tends to be positive throughout the forecast period for all forecasts where the medium and low rates of growth yield a small ex poste negative gap.

9. These trends continue over the 1990-2000 period with the general pattern one of a gradual deceleration of most macro variables to a stable growth path.

10. Thus by 2000 the average annual real non-oil growth for 1978-2000 has declined to 11.42, 10.10, and 7.66 for the high, medium and low forecasts, respectively, with an inflation rate of 11.98, 10.68 and 8.52, respectively.

11. For the period 1990-2000 itself, these rates are 9.86, 8.47 and 7.48 for non-oil GDP and 10.97, 9.53 and 7.3, respectively, for inflation.

All scenarios indicate that the domestic gap declines from a positive to eventually negative position over time. The size of surplus is thus a function of the size of government revenues as well as of its expenditure pattern over time. Greater surpluses in the early years allow the building up of a stock of wealth (while the absorptive capacity remains low). This implies that if the absorptive capacity expands, the economy could draw upon its foreign portfolio, enabling it to maintain a rapid growth even if for some reason oil revenues began to decline. It is those early year surpluses which increase significantly the size of the total financial surplus.

Before too many conclusions are drawn, however, it must be pointed out that the projections made by models of the two gap variety used here are quite sensitive to the assumed values of the savings investment and import functions. Also there is a great degree of variation in judgement as to the extent to which domestic production can be increased to substitute for imports. It would be advisable to appraise for instance such variables as imports separately for different broad categories of goods (as the emerging import structure would reflect the process of adaptation of domestic resources to a multitude of factors such as market conditions and technological possibilities).

Conclusions

The results of the forecasts for 1980-2000 and the optimization procedure for 1980-85 suggest the following.

1. Using a macroeconomic model as well as an operational concept of absorptive capacity, it was possible to determine Saudi Arabia's growth potential and financial position according to several oil scenarios.
2. Oil revenues are seen to affect the economy both positively and negatively. On the positive side, they are still the major growth propelling factor. On the negative side, they are capable of producing excess liquidity and resulting inflation.
3. Economic growth in Saudi Arabia should be able to be maintained at rather high levels without excess inflation while at the same time the foreign work force is gradually reduced. Inflationary pressures remain a major problem for the Saudi Arabian economy, however, especially when we consider the deflationary measures required for its elimination.
4. In order to maintain a steady growth path over the short, medium and longer term, oil revenues must be divided optimally between those funds destined for internal use according to absorptive capacity and those destined for foreign investment.

TABLE 10
MODEL SYMBOLS AND PROPERTIES

Symbol	Variable Name	Characteristic	Possible Policy Variable
PCNP	Private Consumption	Real, endogenous	No
PINP	Private Investment	Real, endogenous	No
GCNP	Government Consumption	Real, endogenous	Yes
GINP	Government Investment	Real, endogenous	Yes
ZNANP	Imports	Real, endogenous	No
EP	Exports	Real, endogenous	Yes, within limits.
GORP	Government Oil Revenue	Real, endogenous	Yes, within limits.
GNREN	Government Non-Oil Revenue	Real, endogenous	Yes
NFPP	Net Factor Payments	Real, endogenous	Yes
NOXNP	Non-Oil GDP	Real, endogenous	No
OGDPNP	Oil Sector GDP	Real, endogenous	Yes, within limits.
SRM	Same Reserve Money	Nominal, endogenous	Yes, within limits.
SGD	Government Deposits in Banking System	Nominal, endogenous	Yes, within limits.
M2	Money Supply	Nominal, endogenous	Yes, within limits.
DFGDP	Non-Oil GDP Deflator (1970 = 1.0)	Currency and coin plus demand deposits plus quasi money.	Yes, within limits.
GENANP	Total Government Expenditures	Nominal, endogenous	Yes
TT	Terms of Trade	Real, endogenous	No
GDEFP	Government Surplus (deficit)	Nominal, exogenous	Yes, within limits.
KP	Capital Stock Proxy	Real, endogenous	Yes, within limits.
VPE	Index of Volume of Petroleum Exports	Real, endogenous	Yes, within limits.
OILP	Oil Price	Exogenous	Slightly
EMPT	Employment	Exogenous	Slightly
ICEUV	Price Index, Industrial counting Exports (1970 = 1.0)	Exogenous	No