ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA

IMPACT OF THE WORLD OIL MARKET ON THE ECONOMIES OF GULF COOPERATION COUNCIL STATES: QUANTITATIVE ASSESSMENT AND FORECAST

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Preface

This research was carried out in order to investigate the impact of policy choices on the future of development in Gulf Cooperation Council economies (GCC).

Two basic scenarios were built and tested: an oil pattern of growth referred to as the "reference scenario" and a structural diversification scenario referred to as the "alternative scenario". Within each scenario, different alternatives were tested.

For analysis and scenario-building purposes, a multiplier model was built. The model-building process was constrained by the economic structures of GCC States, availability of data and analysis-related tasks.

The exogenous variables and parameters of the model were measured and treated econometrically. Parameters related to decision-making and policy choices were extracted from decrees and historical information related to the countries under consideration.

The study relied on the alternative projections of world oil demand available from international sources and, in particular, the International Energy Agency (IEA) and United States Department of Energy projections, after the necessary adjustment and given special assumptions.

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I. ANALYSIS OF THE WORLD OIL MARKET

A. INTERNATIONAL DIMENSIONS

In 1998, world commercial energy production amounted to 9,611,004,000 metric tons. A total of 8.6 per cent of that was produced by GCC States (excluding Iraq).[1]

While the proportion of total world energy demand represented by oil and gas has declined over the last 20 years, it continues to be high: in 1999 it constituted 64.8 per cent of that total.

Oil prices on the world market are liable to sharp fluctuation (see table 1). The events of 1973 and 1982 were responsible for the current high price of oil. However, it should be noted that price rises on both occasions were driven by political rather than economic forces, whereas the severe oil price fluctuations of 1998, when the price per barrel was $8 and in 1999, when it was $30 per barrel is open to a number of interpretations, including the following:

(a) The increase in competitively-priced supplies from fields in the North Sea and the Commonwealth of Independent States;

(b) The oil reserve policies of importing countries;

(c) The decline in grass domestic product (GDP) growth rates in Organization for Economic Cooperation and Development (OECD) countries as a result of the world economic recession;

(d) The East Asian economic crisis;

(e) The impact of "green" political parties and movements in developed industrial countries;

(f) The impact of the fiscal policies of oil-importing countries;

(g) The advance of technology in energy production;

(h) The limited contribution of new and renewable energy sources.

TABLE 1. OIL PRICES, 1970-1999
(*US dollars per barrel*)

Year	Nominal price
1970	2.1
1971	2.6
1972	2.8
1973	3.1
1974	10.4
1975	10.4
1976	11.6
1977	12.6
1978	12.9
1979	29.2
1980	36.0
1981	34.2
1982	31.7
1983	30.1
1984	28.1
1985	27.5
1986	13.0
1987	17.7
1988	14.2

[1] World Bank, *World Development Indicators*, 2001, pp. 152-153.

TABLE 1 (*continued*)

Year	Nominal price
1989	17.3
1990	22.3
1991	18.6
1992	18.4
1993	16.3
1994	15.5
1995	16.9
1996	20.3
1997	18.7
1998	12.3
1999	17.5

Source: The Arab Fund for Economic and Social Development (AFESD), the League of Arab States (LAS), the Arab Monetary Fund (AMF) and the Organization of Arab Petroleum Exporting Countries (OAPEC), *The Unified Arab Economic Report, 2000* (in Arabic).

B. THE ROLE OF OPEC IN DETERMINING WORLD OIL PRICES

In 1991 the Organization of Petroleum Exporting Countries (OPEC) share of world supply was estimated at a mere 41 per cent, in contrast with 53 per cent in 1973. This can be explained by the fact that less efficient producer countries began competing in the world market because of the rise in the prices of oil, a production ceiling of 24 million barrels per day and increased domestic demand for oil in producing countries.

In 1999, the share of Arab countries in world oil and natural gas production was no greater than 27.7 and 11.9 per cent respectively, while the share of GCC States in the same commodities was 18.5 and 5.2 per cent respectively.[2] The share of OPEC countries, and of GCC States in particular, in world oil supply is expected to increase over the next 20 years. Future scenario projections vary according to differences in the built-on assumptions (see table 2).

TABLE 2. PROJECTIONS OF WORLD OIL DEMAND AND SUPPLY

	Total		Supply			
	Year	Values (millions of metric tons)	OPEC Middle East	Other OPEC	Rest of world	Total
IEA projections	1996	72	17.2	45.5	9.3	72.3
	2000	94	40.9	38.1	15.8	94.8
	2020	111.5	45.2	27	39.3	111.5
United States Department of Energy*	1996	73				
	2010	93.5	28.3	64.9		93.2
	2020	112.8	41.6	70.9		112.5

Source: El-Galaby, F., "Oil Price Fluctuations on the World Market: the Causes and the Impact on the Economies of Oil-Producing Countries in the ESCWA region", (in Arabic), table 2.

* Idem., table 4.

Import and reserves policies, in addition to rationalized consumption and fiscal and environmental policies, have become the real factors in determining oil prices on the world market.

[2] AFESD, LAS, AMF and OAPEC, *Unified Arab Economic Report September 2000* (in Arabic) pp. 99-100.

The projections indicate that Middle Eastern members of OPEC are expected to supply some 40.5 per cent of world demand by 2020. When projecting oil demand and supply, it should be borne in mind that oil demand is a function of the total and industrial growth rate, population growth rate, technological progress, environmental policies, progress in using renewable and other new sources of energy and oil prices. Fiscal policies in oil importing countries have also had an impact on demand.

During the period 1980-1998, total energy use grew by 2.9 per cent annually. While commercial energy use has been growing rapidly in low- and middle-income countries, high-income countries continue to use more than five times as much energy per capita.[3]

Factoring in energy use efficiency and the few probable development rates, namely, high, upper and lower normal and environmentally-oriented, four scenarios were built for each of the OECD, East and Central Europe, Commonwealth of Independent States and developing countries groups.[4] The results are shown in table 5.

The projections show the following probable trends in energy consumption, which may determine oil production and export policies:

(a) A rapid increase in energy consumption is expected in developing countries as a result of the development process and explosive population growth rates;

(b) Energy consumption can be rationalized only in OECD, East and Central Europe and the Commonwealth of Independent States. The last two groups of countries will require a huge amount of investment in order to adopt less energy-intensive technologies;

(c) Oil and gas will be the major compounds of the energy supply, followed by coal and lignite;

(d) Production changes in OECD and newly-industrialized countries are expected to reduce demand for energy. Such demand is likely to remain at current levels.

1. *The importance of Gulf States' oil to future supply*

One of the most significant results of the IEA projections is the importance of Gulf oil, mainly from Iraq, Saudi Arabia, Kuwait, and the United Arab Emirates. In order to meet the annual 2 per cent increase in world demand and compensate for a 50 per cent production decrease in other produces countries during the period 1996-2020 those four countries will be required to increase annual production by 7 per cent to 40 million barrels per day.[5]

The data show that in 1999-2000, GCC States had 46.5 and 15.1 per cent of world reserves of oil and natural gas respectively (see table 3). Projections of future reserves that take into account depletion rates in other OPEC (except Iraq) and non-OPEC countries and current rates of exploitation show GCC reserves increasing.[6]

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[3] World Bank, op. cit., p. 153.

[4] World Energy Council Commission, *Energy for Tomorrow's World*, (New York, St. Martin's Press, 1993) pp. 40-43.

[5] F. El-Galaby, "Oil Price Fluctuations on the World Market: the Causes and the Import on the Economies of Oil-Producing Countries in the ESCWA Region", in *The Role of Oil in Arab Economies in the Light of Global Changes*. Proceedings of the Conference on the Future Role of Oil in the Economies of the ESCWA Member States, held in Beirut on 3 and 4 October 2000. Joint ESCWA/Arab Society for Economic Research publication, pp. 40-41. (In Arabic)

[6] OAPEC, *Monthly Bulletin*, No. 5 (May 1999) (in Arabic), pp. 37-38, and *The Unified Arab Economic Report, 2000*, pp. 97-98.

TABLE 3. WORLD OIL AND NATURAL GAS RESERVES, 1999-2000

Countries	Oil reserves (2000) (billions of barrels)	Natural gas reserves (1999) (billions of cubic metres)
GCC States	481.15	22 675
Bahrain	0.15	110
Kuwait	96.50	1 480
Oman	5.40	805
Qatar	4.50	8 500
Saudi Arabia	263.50	5 777
United Arab Emirates	98.10	6 003
Total Arab countries	646.46	33 706
Total non-Arab OPEC	189.78	34 558
Commonwealth of Independent States	57.00	55 982
North Sea*	15.94	4 409
United States of America	21.03	4 645
Other world	46.81	13 028
Total world	1 034.35	150 356

Source: OAPEC, *Monthly Bulletin*, No. 5 (May 2000).

* United Kingdom and Norway.

II. BUILDING A MULTIPLIER MODEL FOR ECONOMIC PROJECTIONS

Chapter one identified certain features of GCC economies, including heavy dependence on the production and export of oil, the price of which is dependent on the world oil market and its fluctuations; a dichotomy in GCC State economic structures; the impact of oil production and exports over the past 30 years on investment, current expenditure, human development, the modernization process, the growth rates of other activities via capital and current Government expenditure, job opportunities created by Government and Government subsidy programme; the fact that industrial growth in most GCC States has centred on oil products and petrochemicals; and the openness of those economies to world markets, which has resulted in remarkable outflows to international markets.

Such features have influenced the functioning mechanisms of those economies by increasing the weight of exogenous or international factors in determining the values of market indices and stability and economic growth. This had made it easier to abstract and fix the main variables of the model and their relations. However, the values of many parameters are either exogenous or related to decision-making. While those features can usefully be employed in order to explain the current situation, they are not sufficient to enable future projections to be made and scenarios and visions to be built.

A. MAIN HYPOTHESES OF THE MODEL

In building the projection model, the following principal hypotheses were assumed:

(a) The dominant factor in determining growth is the level of production and export of oil and natural gas, which is determined by the interaction of the world demand for and supply of oil and gas;

(b) The GCC economies are heavily reliant on Government expenditure, which is largely dependent on oil and gas revenues. In this context, the current pattern of policy choice and decision-making is assumed to continue, notwithstanding reform efforts;

(c) Price levels will remain stable throughout the period covered by the projection.

1. *The prototype model*

Using the balance income-expenditure equation,

$$Y_t = C_t + G_t + I_t + I_{gt} + V_t + E_t - M_t \qquad (1)$$

Where

t = years

Y = GDP

C = private consumption

G = current Government expenditure (consumption)

I, I_g = private and Government investment

V_t = increase/decrease in stocks

E = total exports

M = total imports

Given the following behavioural and decision-making relations,

$C_t = c_0 + c_1 Y_t$ (2)

$E = f(Y_{0t}, Y_{nt})$ (3)

Where

Y_{0t} = oil GDP

Y_{nt} = non-oil GDP

$E_t \; E_{0t} + E_{nt}$ (3)

E_{0t} = oil exports

E_{nt} = non-oil exports

$R_t = \Phi (E_{0t,} Y_{nt})$ (4)

R_t = total Government (budget) revenue

$M_t = m (E_t , N_t) = m (E_{0t} , E_{nt} , N_t)$ (5)

N denotes the increase of imports related to population growth and import patterns, namely, import inertia.

$B_x = E - M$ (6)

$B_i = R_t - (G_t + I_{gt})$ (7)

(6) and (7) are consequently by definition balance of trade and budget balance equations.

Take into consideration the set of behavioural and decision-making parameters (λ, ξ, e, m, d, v, …..) (see annex I).

Solving the model, we get the following reduced form:

$Y_t [1- c_1 -v - (1-d) \{\xi - e (1-m)\}] = c_0 + E_{0t} \{ (1- m) (1- e) +$

$(\lambda - \xi) \} + I_t$ (8)

let $[1- c_1 - v - (1 - d) \{ \xi - e (1- m) \}] = \sigma$

Therefore, $\sigma Y_t = c_0 + E_{0t} \{(1 - m) (1 - e) + (\lambda - \xi)\} + I_t$

$Y_t = 1/ \sigma [c_0 + E_{0t} \{(1- m) (1 - e) + (\lambda - \xi) \} + I_t]$ (9)

Equation (9) relates the growth of GDP to changes in oil exports (E_{0t}), private investment I_t and the complex value of the multiplier σ.

The value of GDP (Y_t) in any given year (t) is restricted as shown in (9) by the propensity to export non-oil goods and services (e), the inverse of export/import coverage coefficient (m), the threshold of tax rates and other non-oil revenues (ξ) and the determined level of oil revenues to oil exports (λ).

σ - as shown is a complex multiplier value, which is affected by a set of parameters, some of which are dependent on the dynamics of behavioural relations including the propensity to consume c_1 and export/import coverage 1/m and decision parameters such as the weight of inventory to GDP (v).

As a result, the value σ is variate and predictable. This, in turn, makes it possible to treat σ as a target value for planning tasks.

2. *Non-oil productive sectors*

In its aggregate form, the model distinguishes between two sectors or groups of sectors, namely, oil and non-oil, in accordance with the weight of oil in production, investment and exports.

Analysis of economic structures in GCC States shows the remarkable growth and weight of construction and housing, electricity and water, trade, manufacturing, finance, real estate and transport and communications activities. It has also been noted that growth in most of those activities is largely a product of current and capital Government expenditure, which is heavily dependent on oil revenue. Manufacturing activities were centred on oil, including refineries and petrochemicals, which necessitated special treatment in the model.

Finance, real estate and business activities represent a forward position in non-oil activities owing to their weight in GDP. Debates on policy priorities during the second half of the 1980s emphasized that those activities should be considered as a complete substitute for oil activities within the alternative, or value-added strategy.[7] This vision was based on the liquidation of oil wealth and the transformation of its returns into financial assets. That strategy was constrained by institutional factors, Government intervention, the inadequacy of financial incentives in Kuwait, speculative bubbles and so on.[8]

In order to be able to predict the impact of the financial sector on future developments in Kuwait, fund-flow tables and an expanded GCC model, based on sophisticated sequence alignment and modelling (SAM) combining financial and real sectors and institutions must be available.

Such models include as main activities manufacturing; electricity production and water; transportation and communications; trade and finance; and construction and housing. Analysis shows that those activities are not entirely independent from oil, given the current economic structure, its mechanisms and decision-making rules. Function (10) relates GDP generated in manufacturing sectors (activities) (Y_1) to oil prices (P_0), oil production quotas (Q_0) and the population growth rate.

Population growth, combined with oil income, is thought to represent local demand on manufacturing.

The relationship between manufacturing and crude oil and gas activities is double-sided. Oil refining and petrochemicals compensate for the decline of crude oil and gas prices. By raising the value-added gained from manufacturing activities, oil revenues sustain stability. Furthermore, the weight of oil and gas in manufacturing is remarkable not only as an industrial raw material, but also as an energy input.

Observation shows a strong correlation between prices and demand for non-oil and oil product.

$$Y_{1t} = (P_{0t}{}^{\alpha 1}\, Q_{0t}{}^{\alpha 2}\, h^{\alpha 3}) \qquad (10)$$

Function (10) takes the shape of a homogenous production function where the determining factors of manufacturing production levels are the demand variables rather than the values of factors of production.

$$Y_{nt} = Y_{1t} + Y_{2t} + Y_{3t} + Y_{4t} + Y_{5t} = Y_{1t} + \Sigma^{k}_{i=2}\, Y_{it}$$

$$Y_{nt} = Y_{it} + Y_{1t}\, \Sigma^{k}_{i=2}\, B_i$$

B_i is the real or planned weight of activity i in generating GDP (Y).

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[7] Donald Lessard, *The Financial Sector of Kuwait: Present Structure and Prospects for Future Development*, (Kuwait, Kuwait Institute for Scientific Research, 1988), Ch. 4.

[8] Ibid. and Alice Amsden, *Macroeconomics and the Management of Aggregates*, (Kuwait, CMT-International, 1988).

3. *Public budget derivation*

Public budget components can be derived from the values of E_0 (exogenous variable), estimated value of Y_n and both behavioural and decision-making parameters λ, ξ for the revenue side and g, ig for the expenditure side (see annex I).

$$R_t = R_{0t} + R_{nt} \quad (12)$$

$$R_{0t} = \lambda E_{0t} \quad (13)$$

$$R_{nt} = \xi Y_{nt} \quad (14)$$

$$G_t = g R_t \quad (15)$$

$$I_{gt} = (1-g) R_t \quad (16)$$

Relations (15) and (16) assume that revenue and expenditure are balanced, which is the target of policy makers.

There are two ways to estimate public budget aggregates G & I_g. The first is to deal with public finance policy targets as given and the second is to deal with them as time trend variables. Both approaches were tested on historic data and gave similar results. The parameters of the past time trend were introduced as exogenous variables of the model. In this sense, it has been remarked that the estimated coefficients (g and i_g) for the last 15 and 20 year time series are relatively stable. However, Government revenues have been affected.

The difference between the estimated value using formulas (15) and (16) and the time series analysis should not be great, because time series analysis was used in the estimation of the value (g) itself, which can reflect fiscal policy targets. However, in the long term, such targets are not predictable.

For further future elaboration of the model, the public budget sub model can be treated as a constrained problem, the objective function of which is to minimize deficit or surplus.

4. *External balance relations*

In the built model, oil exports are a direct or indirect determinant of other variables. Function (5) of the model (imports M) distinguishes between two components of imports. The first relates to the export coverage capacity of imports, which determines the inverse value of the parameter (m^{-1}) and the second is the potential propensity to import related to population growth and the inertia of importation related to import policy defects, which assesses the causes of foreign trade deficits and indebtedness.

B. SOME REMARKS RELATED TO THE ESTIMATION PROCESS

The main purpose of this research is to examine the impact of dependence on oil revenues and the respective trajectories of growth and their influence on the assumptions and structure of the model. In the first stage, the consumption and tax and exports functions are assumed to be simple and to concentrate on the main task. For further sophistication, the model formulation process permits modifications in both behavioural relations and their mathematical formulation. The current choice is adapted to the prevailing economic situation and, to a large extent, simulates the existing decision-making process.

C. DATABASE

A crucial part of the database is the set of exogenous parameters that link both policy and behavioural variables with the sources of income generation, namely, oil and non-oil. These are chosen on the basis of the structural characteristics of the GCC economies and their growth trajectories. The choice was also dictated by the availability of data and the assumptions made in order to simplify the model. The statistical

formulation of the parameters was thought to be sufficiently elastic for data restriction, previous structural analysis and policy-making purposes. Some parameters were estimated on the basis of econometric relations, while others were based on simple statistical formulas.

The remarkable variation in the results should be noted. This variation is consistent with the severe fluctuations in oil prices and revenue, even for those variables indirectly related to oil prices and export changes via Government expenditure and GDP growth rates.

Table 4 shows the values of behavioural and decision-making parameters, which are estimated exogenously.

TABLE 4. ESTIMATED BEHAVIOURAL AND DECISION-MAKING PARAMETERS

	Parameters							
Countries	ν	c_1	m	e	λ	ζ	d	σ
Bahrain	0.05	0.427	0.837	0.185	0.9	0.065	0.142	0.4931
Kuwait	0.07	0.59	0.808	0.05	0.9	0.01	0.128	0.5219
Oman	0.02	0.687	0.777	0.18	0.95	0.07	0.14	0.3625
Qatar	0.02	0.420	0.794	0.05	0.75	0.01	0.125	0.6716
Saudi Arabia	0.031	0.572	0.96	0.07	0.80	0.08	0.191	0.3151
United Arab Emirates	0.014	0.435	0.795	0.217	0.90	0.06	0.189	0.5624

The values are estimated as follows:

c1- estimated from the consumption function.

ν- estimated directly from crude data. The available values of ν represent average values for the period 1990-1999.

m- estimated as a time series coefficient.

e- estimated as a time series coefficient.

λ- extracted from regulations organizing the allocation of oil export revenues in the case of Kuwait and from decrees in the case of Qatar.

For the other countries it has been estimated as an average value of the period 1990-1999.

ζ- estimated as a ratio of non-oil revenues to non-oil GDP (average for 1995-1999).

The estimate aimed to avoid the impact of profit transfers from public enterprises to the treasury. Most of the enterprises were completely or partially privatized. The remainder are in the process of privatization.

d- is estimated from real direct statistics of local use, production and export of oil and gas and GDP.

III. FUTURE DEVELOPMENT SCENARIOS FOR GCC ECONOMIES

This chapter examines two approaches to policy choice. The first assumes the continuation of the current policy pattern and formulates a reference scenario, or what can be called an "oil pattern of development". The reference scenario is not merely a typical simulation of the past, but a simulation of its growth trajectory policy choices, decision-making rules, procedures and visions. In this scenario, four levels of oil price, namely, high, stable, medium and low will be examined and possible alternatives in world demand for oil will be considered.

The second is based on the outcome of analysis of oil prices and revenue on economic variables and in particular, on growth rate levels, budget and balance of payments stability, per capita income and other aggregate macro-economic indicators, benchmarked against stabilization and growth targets. This scenario puts emphasis on the alternative policy package.

A. OIL PATTERN OF DEVELOPMENT SCENARIO

Oil price trends, as shown in table 1 reflect a high average nominal price of $36 per barrel, which could not be sustained. Price fixing was only possible when supplies were in the hands of a monopoly. The current oil price is some $18 per barrel. The registered average minimum price is between $10 and 11 per barrel. Technical studies have proved that oil can be produced at a cost of $8 per barrel, which is close to the marginal cost in North Sea managerial areas and wells. Such studies take into consideration current technology, input prices and fiscal policies in both producing and importing countries.

Nominal prices should be treated with caution. They differ from real prices not only in terms of purchasing power parity, but also in their relation to final consumer prices in the importing markets. Studies observed the compensatory effect of local fiscal polices in such markets.

The final price in the end market maybe as high $140, including the cost of refining, transportation and taxes.[9] The difference between final and nominal price may therefore be considered as a rent of which the producer is deprived. This study will focus on nominal prices.

1. *Price alternatives*

(a) *Low price*

A low price covers current production costs, including depreciation, compensates for high investment costs and allows for the cost of replacement technology.

New investment costs are expected to increase because of the high cost of exploration and extraction in new areas, the additional cost of R and D and the increasing maintenance cost of old wells.

Little information on production cost is available. In Saudi Arabia, it is estimated to be $20, including social costs.[10] The price of oil is likely to fall below $15 per barrel, because oil production is not restricted to the Gulf basin. The study assumes many restrictions related to the above-mentioned factors.

(b) *Stable price*

A stable price is, by definition, the most usual real price. A price may be considered stable when it sustains production and export levels and guarantees a minimum level of investment in the activity under consideration. In general, real prices have ranged between $18 and 22 per barrel. The average price during the 1990s, namely, $20 per barrel, may be considered as a stable price. However, in the forthcoming 20 years, that price would no longer cover expected average production costs, especially when environmental costs are taken into consideration.

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[9] Hassan Abdullah, quoted in El-Galaby, loc. cit., pp. 84-85.

[10] Ahmad Zaki Yamany, keynote speech at the Conference on the Future Role of Oil in the Economies of the ESCWA Member States, loc. cit.

(c) *Medium price*

The medium price is a hypothetical substitute for the stable price, and may be considered as the fair price for crude oil (only) over the forthcoming 20 years. It may change if final consumer price considerations or exchange rates change.

(d) *High price*

It is difficult to determine exactly what constitutes a high price, because higher prices are usually temporary and a response to market forces. High prices in the oil industry have prompted R and D on new and renewable sources of energy, and encouraged the investigation of marginal wells. High prices have also made it possible for marginal producers to enter oil markets. For the sake of analysis and projection, $40 per barrel can be accepted as a "high price" for current levels of production and investment. The experience of 2001 shows that a price of almost $40 did not present any short-term challenge to the oil industry or related fiscal policies, and would be acceptable in the long term given a gradual annual increase from $18 to $40.

2. *Assumptions about changes in world demand*

Certain assumptions must be made in order to explain price alternatives. Therefore, based on World Environment Center estimates, and given stable supply side effects, we assume the following:

(a) There will be explosive rates of population growth, in developing countries in particular;

(b) There will be higher rates of growth in developing economies than in the rest of the world;

(c) There will be only a limited decrease in per capita energy use in East European Countries with economies in transition, the Commonwealth of Independent States and developing countries because of the high cost of adopting new oil production technologies and of reducing energy consumption;

(d) Environmental aspects will have considerable impact on energy use.

Population and economic growth rates are expected to increase both regional and world energy demand, whereas technological and environmental factors will lower demand. Net demand will be the outcome of the interaction of these two opposing forces.

Various world demand scenarios are set forth in table 5.

TABLE 5. VARIOUS WORLD ENERGY DEMAND SCENARIOS

	Cases			
Annual economic growth rates	High	Revised current	Current	Environmentally-oriented
OECD	2.4	2.4	2.4	2.4
Transitional economies	2.4	2.4	2.4	2.4
Developing economies	5.6	4.6	4.6	4.6
Total world	3.8	3.3	3.3	3.3
Annual decrease of energy intensiveness				
OECD	(1.8)	(1.9)	(1.9)	(2.8)
Transitional economies	(1.7)	(1.2)	(2.1)	(2.7)
Developing economies	(1.3)	(0.8)	(1.7)	(2.1)
Total world	(1.6)	(1.3)	(1.9)	(2.4)
Technology transfer	High	Normal	High	Extremely high
Institutional reform	High	Normal	High	Extremely high
Total expected increase in energy demand (billion barrels per day)	17.2	16	13.4	11.4

Source: World Energy Council Commission, *Energy for Tomorrow's World*, (New York, St. Martin's Press, 1993), p. 41.

Note: ( ) indicates negative.

3. *Export quotas*

It is difficult to predict export quotas. Within OPEC, each member's future quota is determined by its reserves, current and projected extraction rates and the rate of domestic energy-use growth.

At the end of October 2000, a ceiling of 26,700 million barrels per day was reached for oil production in OPEC member States. With effect from April 2001, this ceiling was reduced to 24,201 million barrels per day. Table 6 sets forth the production quotas of the main States and the percentage of OPEC production they represent.

TABLE 6. OPEC MEMBER STATES: PRODUCTION AND QUOTAS

	Production quota (Thousand barrels per day)					
State	31 October, 2000	Percentage	1 February, 2001	Percentage	1 April, 2001	Percentage
Kuwait	2 141	8	2 021	8	1 941	8
Qatar	692	2.6	653	2.6	627	2.6
Saudi Arabia	8 674	32.5	8 188	32.5	7 865	32.5
United Arab Emirates	2 333	8.7	2 201	8.7	2 113	8.7
Total	13 840	51.8	13 062	51.8	12 546	51.8
Other Middle-East OPEC	9 787	36.7	9 236	36.7	8 870	36.7
Other OPEC	3 076	11.5	2 902	11.5	2 785	11.5
Total OPEC	26 703	100	25.201	100	24 201	100

Source: OAPEC, *Monthly Bulletin*, No. 5, May 2001, p. 5.

In 2010 and 2020 the OPEC share of world oil production and exports is expected to gradually increase. Individual OPEC member State quotas will depend on the status of their respective reserves, which will affect national production policies. Table 7 provides data on Arab and world crude oil reserves for the period 1994-1998.

TABLE 7. ARAB AND WORLD CRUDE OIL RESERVES, 1994-1998
(*Billion barrels at year end*)

State	1994	1995	1996	1997	1998	Percentage
Bahrain	0.21	0.21	0.21	0.21	0.16	0.02
Kuwait	96.50	96.50	96.50	96.50	96.50	9.18
Oman*	5.18	5.24	5.25	5.24	5.40	0.51
Qatar	4.50	4.50	4.50	4.50	4.50	0.43
Saudi Arabia	261.37	261.450	261.50	261.50	261.50	24.86
United Arab Emirates	98.10	98.10	98.10	98.10	98.10	9.33
Iran	94.30	93.70	92.60	92.60	89.70	8.53
Iraq	112.00	112.00	112.00	112.00	112.00	10.65
Indonesia	5.13	5.33	4.98	4.98	4.98	0.47
Venezuela	64.88	66.33	72.67	74.93	72.60	6.90
Nigeria	20.99	20.83	20.83	20.83	22.5	2.14
Total OPEC	815.1	816.07	818.66	821.48	817.92	77.5
United States of America	22.96	22.46	22.35	22.02	22.55	2.14
Northern Sea	13.94	14.71	15.75	15.4	16.11	1.53
Mexico	50.78	49.78	48.8	47.82	47.82	4.55
Commonwealth of Independent States	57.00	57.00	57.00	57.00	57.00	5.42
Other world	41.53	43.94	41.62	42.98	46.14	4.4
	1 045.96	1 046.33	1 048.34	1 050.82	1 051.74	100

Source: OAPEC, Monthly Bulletin, No. 5, May 1999, pp. 37 and 38.

* Non-OPEC member.

Assuming, therefore, that 42 per cent of increased world energy demand to 2020 will be satisfied by GCC production, it is possible to estimate compound growth rates. Those rates are set forth in table 8.

TABLE 8. ANNUAL OIL AND GAS PRODUCTION REAL GROWTH RATE IN GCC STATES, 2002-2020

Price alternatives	High	Medium	Low	Stable
Annual production growth rates	1.3	1.4	1.5	1.6

Rates are estimated on the basis of IEA alternative world energy demand scenarios and the rates of increase in domestic demand. It should be noted that suppliers adapt themselves to the effect of demand on prices.

For Bahrain and Oman, it has been assumed that the depletion of oil reserves is compensated for by gas production and reserves.

Given the expected volume of production and prices, it is possible to estimate oil and gas production in terms of oil equivalent (metric tons), as shown in tables 9 and 10.

TABLE 9. ESTIMATED VALUE OF OIL PRODUCTION IN GCC STATES, 2010
(*Millions of US dollars*)

States	Low price scenario	Stable price scenario	Medium price scenario	High price scenario
Bahrain	1 245 973	1 677 770	25 415 843	3 422 315
Kuwait	12 092 166	16 282 757	24 666 077	33 213 563
Oman	5 606 878	8 388 850	11 437 130	15 400 416
Qatar	3 906 125	5 259 809	7 967 867	10 728 956
Saudi Arabia	48 997 882	65 978 302	99 947 806	134 582 522
United Arab Emirates	14 534 273	19 571 186	29 365 678	39 921 230

TABLE 10. ESTIMATED VALUE OF OIL PRODUCTION IN GCC STATES, 2020
(*Millions of US dollars*)

States	Low price scenario	Stable price scenario	Middle price scenario	High price scenario
Bahrain	1 417 761	1 928 022	2 949 613	4 011 040
Kuwait	13 759 371	18 428 918	28 625 989	38 927 145
Oman	6 904 302	8 676 098	13 273 265	18 049 681
Qatar	4 444 681	6 044 349	9 247 035	12 574 611
Saudi Arabia	55 753 451	75 819 460	115 993 510	157 734 154
United Arab Emirates	16 538 182	22 490 375	34 407 229	46 788 784

4. *Future investment trends*

Increased oil revenue has strongly influenced investment in GCC States over the past 30 years. Most Government investment was in infrastructure and, in particular, in roads, transport, communications, electricity, water, education, health and the mass media. While such investment patterns did contribute to human development, they were not, on the whole, successful in making those economies less dependent on oil and gas production. This can be explained by, *inter alia*, the lack of information on domestic absorptive capacity, the absence of entrepreneurs, the inadequacy of the national labour force, small markets, the preference for portfolio investments and the monopolization of oil wealth by the Government. Some of these factors still obtain, and are expected to affect investment within the "oil pattern" and other scenarios.

The outflow of funds to world markets is a direct result of the lack of domestic investment. Future investment decisions will be influenced by additional restrictions, including reduced levels of surplus because of a decline in oil revenues and indebtedness while consumption and expenditures continue at the

same level. Meanwhile, however, stabilization and privatization policies and openness to the world economy will provide incentives for both domestic investment and FDI, which in all GCC States with the exception of the United Arab Emirates is limited and normally takes the form of joint ventures in oil industries.

The study assumes that GCC investments abroad are not exposed to depreciation because of fluctuations in the world market and domestic deficits.

In order to predict gross fixed capital formation in the forthcoming 20 years, the following procedure may be used.

$$I_{t-1} = f(Y_{t-1}, FDI) \qquad (17)$$

Function (17) relates gross fixed capital formation in the year t to GDP in the year t-1, which reflects an indirect correlation to oil GDP within the frame of the model.

To date, FDI has not had a predictable trajectory, because it did not constitute a time trend in itself and is dependent on many institutional and political factors.

As has been mentioned above, the regulatory changes that resulted in adjustment policies are expected to have a remarkable effect on FDI in the oil industries. Furthermore, OFFSET regimes, intra-investment policies and integration procedures between GCC countries may have a strong influence on FDI levels and rates of growth.

In this context the previous function may be formulated as follows:

$$I_t = i_0 + i_1 y_{t-1} + i_2 f_t \qquad (18)$$

Predictions for investment levels in the years 2010 and 2020 face many analytical and statistical problems which have influenced the rates of investment growth of both the Government and the private sectors. Most significant of these is the pronounced interdependence of oil revenue and public expenditure and the dependency of investments on savings accumulated from previous years. Observations show that a one year lag, according to the model, is not adequate. However, it is a complex and arbitrary process to determine lag intervals.

Real investments appear to have been affected by portfolio investments and their fluctuations, at least in the case of Kuwait and Bahrain. However, this should be tested in a separate study. Furthermore, privatization exhausts private savings by transferring ownership, rather than accumulating new assets. However, this will no longer be the case beyond 2010.

In some cases, it was not possible to separate private from total investment within the initial data. Some assumptions based on the historical trends were introduced. In other cases, previous investment structures were used in order to disagregate the data into their components.

Smoothing time series could go some way to avoid the sharp changes of investment levels and rates.

Table 11 shows the most reasonable compromised rates of investment growth for the private sector.

TABLE 11. AVERAGE ANNUAL GROWTH RATES IN PRIVATE INVESTMENT
(*Percentage*)

Country	Bahrain	Kuwait	Qatar	Oman	Saudi Arabia	United Arab Emirates
Rate of investment growth	4.4	4.0	3.6	3.9	4.8	5.6

B. EXPECTED GDP VALUES AND RATES OF GROWTH

Application of the multiplier model set forth in chapter II in order to project the impact of oil price and revenues on GDP and other derived macro economic variables will be run under the following two main alternatives:

1. *The scenario in which 100 per cent of the oil quota produced is exported*

This scenario assumes that heavy world demand for GCC oil absorbs full production quotas, while growing domestic demand must also be satisfied.

Calculations of growth rates of predicted values of four alternatives of oil pattern scenario are shown in table 12.

The results show that in all GCC States with the exception of Oman, GDP growth rates were moderate when oil exports were taken as a main factor. The result remains valid even for the high price version of the scenario.

TABLE 12. AVERAGE ANNUAL GDP GROWTH RATES WITHIN THE "DEVELOPMENT OF OIL PATTERN SCENARIO"

Scenario versions	I	II	III	IV
2002-2010	(0.06)	0.6	2.4	3.9
Bahrain				
2011-2020	0.80	1.45	2.4	1.4
2002-2010	0.4	2.5	4.62	6.55
Kuwait				
2011-2020	1.2	1.5	2.8	3.9
2002-2010	4.4	6.9	8.9	11.5
Oman				
2011-2020	3.6	4.4	6.0	7.2
2002-2010	(0.02)	1.4	3.7	5.5
Qatar				
2011-2020	0.8	1.7	3.1	4.1
2002-2010	3.3	4.8	7.2	9
Saudi Arabia				
2011-2020	3.0	3.8	5.1	6.2
2002-2010	(0.02)	0.7	3.0	4.9
United Arab Emirates				
2011-2020	(2.6)	0.9	2.4	3.5

Note: ( ) indicates negative.

In this context, part of GDP growth is due to autonomous private investment.

A comparison of these growth rates with expected GDP growth rates in developing countries as estimated in the IEA report shows that such rates in GCC States are lower than others for the first three scenarios (see table 13).

TABLE 13. EXPECTED GDP ANNUAL GROWTH RATES IN DEVELOPING COUNTRIES, 2000-2020
(*Percentages*)

Sub-Saharan Africa	Pacific countries	Asian central planning countries	South Asian countries
5	4	5.1	4.0

Source: World Energy Council Commission, *Energy for Tomorrow's World*, (New York, St. Martin's Press, 1993), (in Arabic), p. 320.

2. *Scenario 2, based on the assumption that a portion of the determined quota is exported*

The portion exported depends on the level of domestic use of oil products, which is expected to increase commensurate with economic and population growth. In general, we have assumed that current levels of (d) will continue to 2010 and that per capita energy consumption will gradually increase by 1.45 per cent annually during 2010-2020.

This case therefore largely resembles the previous one, but has lower GDP values and rates of growth (see annex II). The results of the two cases lead one to conclude that within the oil scenario oil production and exports no longer contribute to the growth target because they are subject to tighter restrictions with respect to quota and volume because of domestic use.

C. IMPACT ON PER CAPITA GDP

Per capita income is a function of both GDP and population growth. Given current rates of population growth, population policy targets in GCC States and estimated values of GDP, estimates for per capita GDP have been calculated as shown in tables 14 and 15.

TABLE 14. POPULATION AND PER CAPITA GDP GROWTH IN YEAR 2010

Country	Average annual population growth rates* (percentage)	Population (millions)	Per capita GDP			
			I	II	III	IV
Bahrain	3.54	0.97	1 805	2 134	2 790	3 460
Kuwait	3.20	3.12	3 413	4 336	6 360	8 025
Oman	1.66	2.896	3 185	4 268	5 454	6 998
Qatar	3.31	0.883	29 302	36 824	54 914	67 213
Saudi Arabia	3.24	29.44	25 966.4	32 380.7	452 126.1	58 295.8
United Arab Emirates	4.2	4.405	36 110	43 581	58 109	73 766

* *Source*: Arab Fund for Economic and Social Development, 2000.

TABLE 15. POPULATION AND PER CAPITA GDP GROWTH IN 2020

Country	Average annual population growth rates* (percentage)	Population (millions)	Per capita GDP			
			I	II	III	IV
Bahrain	3	1.304	1 797.3	2 086.3	2 664.7	3 265.3
Kuwait	2.6	4.033	2 640	3 354	4 920	6 208
Oman	1.5	3.361	3 582	4 177	5 719	7 321
Qatar	3	1.2266	26 429	330 343	62 590	60 042
Saudi Arabia	3	39.565	24 538.6	30 178.8	41470.8	53 203.3
United Arab Emirates	3.6	6.273	34 846	41 044	53 458	66 355

* Target.

Because of high natural rates of population growth the effects of migration and moderate expected rates of GDP, per capita income growth is also expected to be moderate, as shown in table 16.

The results indicate that with the oil pattern of growth and without effective population control policies will make average welfare positions worse.

TABLE 16. EXPECTED GROWTH RATES OF PER CAPITA GDP, 2002-2010
(*Percentage*)

Countries	Scenarios			
	I	II	III	IV
2002-2010	(3.5)	(2.84)	(1.10)	0.06
Bahrain				
2011-2020	(2.9)	(1.42)	(0.58)	(1.55)
2002-2010	(2.71)	(0.67)	1.38	3.25
Kuwait				
2011-2020	(1.36)	(1.72)	0.19	1.27
2002-2010	2.69	5.15	7.13	9.67
Oman				
2011-2020	2.07	2.86	4.43	5.62
2002-2010	(3.22)	(1.85)	0.38	2.12
Qatar				
2011-2020	(2.14)	(1.26)	0.10	1.07
2002-2010	0.06	1.51	3.83	5.58
Saudi Arabia				
2011-2020	0.0	0.78	2.04	3.11
2002-2010	(5.54)	(4.86)	(2.68)	(8.898)
United Arab Emirates				
2011-2020	(5.98)	(2.61)	(1.16)	(0.1)

Note: ( ) indicates negative.

D. BALANCE OF TRADE

In the light of import potential capacities, current import patterns, population growth and the small proportion of non-oil exports in a uni-sector economic structure, the results of the projections (see annex II) show that in the low and stable oil price scenarios, trade balances will be in deficit. In some cases and for some countries, that may also apply to the medium oil price scenario. As a result, reserves or, mainly in the case of Kuwait, portfolio investments abroad will depreciate.

The balance of trade in the United Arab Emirates is expected to be negative in all scenarios. This may be due to the high flows of imports because of re-export activity in Dubai and other Emirates. Such activities have increased rapidly in the past 15 years and are expected to grow at higher rates in future.

E. PUBLIC FINANCE

Running the calculations for the public budget, and taking into consideration the public expenditure time trend using the induced parameters of the model (see annex IV), we may draw the following conclusions:

(a) The effect of the oil pattern on economic development stems not only from the cost/benefit results related to oil prices or exported quantities but also from the related pattern of behaviour. In this context it has been observed that the expansion or reduction of public expenditure is related directly to rises or falls in oil prices and revenues, even in recent years, when awareness of the severity of the problem has increased;

(b) Following this pattern of behaviour on the expenditure side, the estimates are not encouraging with respect to the volume of deficit and its ratio to GDP in most GCC States for the most of the scenario alternatives, with the exception of the high price scenario;

(c) On the revenue side, the rigid system of taxes and tax collection will not help to compensate for the growing deficit, despite structural changes in revenues in some cases;

(d) Deficits continue to increase along the time span, even without any improvement in per capita expenditure because of population increase.

In view of the foregoing, increased public expenditure equal to or higher than the population growth rate is to be expected.

IV. STRUCTURAL DIVERSIFICATION SCENARIO

Chapter III demonstrated that the oil pattern scenario leads to restricted growth which is highly dependent on stochastic, uncontrolled variables. It may also exacerbate economic distortions and instability in terms of budget and foreign trade balances.

The prospects for GDP and per capita GDP growth are limited. Capital formation is also affected by fluctuations in oil and gas prices and revenue. Furthermore, the capacity of crude oil, natural gas and related activities to absorb the labour force surplus is restricted by the fact that those industries are capital-intensive.

This scenario aims to evaluate different policy choices for development through the restructuring of the GCC economies, taking into consideration population, labour force constraints and market capacities.

A. MAIN HYPOTHESES OF THE SCENARIO

The main hypotheses of the scenario include the continuation of oil price fluctuations around low and stable prices, with the emphasis on stable price; maintenance of a reasonable per capita GDP growth rate being a main development target; and raising productivity and economic restructuring will be a means of achieving that target.

In "structural diversification" scenario building, two principal questions must be answered, namely, the most suitable rate of growth of per capita GDP and the most appropriate weights to be given to the most effective sectors for accelerating and integrating growth.

1. *Determining the most suitable per capita GDP growth rate*

By achieving a suitable rate of per capita GDP growth, which is the indicator that expresses the required rate of human development or the acceptable welfare level, we are indicating the required interaction between population levels and economic growth.

Per capita GDP in GCC States has fluctuated considerably over the past 15 years, because of fluctuations in GDP and the effects of migration policies and regulations. Unless other human and economic development goals are determined it is difficult to decide on an optimum level. However, for the sake of scenario comparisons and in order to investigate the difference between choices and their impact, a determination based on reasonable argument may be accepted.

B. SECTORAL CHOICES

The sectoral choice is bounded by the availability of natural as well as human resources in the short and medium term. Production is constrained by market capacity.

The abundance of oil and gas attracts investment activities under certain special conditions, the first of which is the possibility of increasing their competitiveness in the world market.

The most significant factor in restructuring GCC economies is the volume and structure of the labour force. The trade-off between economic and social factors will affect the choice of activities. Assuming that finance does not constrain investment expansion, the choice will take place on the basis of labour and/or capital intensity.

The current distorted population and labour force structures, where expatriates constitute the majority, will limit the expansion of labour-intensive activities and projects.

The effect of educational and job structures can be determined in the medium-term by training, educational restructuring and rehabilitation.

However, the abundance of oil and gas still has great impact on the formation of restructuring programmes aimed at attracting FDI.

GCC States have a comparative advantage in their geographical location, which can help in developing activities such as marine services, shipbuilding and repair. The services sectors, information, off-shore banking and other activities may also be investment-attractive.

Because of under-population and expected or potential unemployment, service-related, transportation, off-shore financial and construction activities may be most appropriate for the absorption of the local labour force through retraining and institutional reform. Reports on the investment atmosphere in GCC States indicate a growing trend in these investment channels.[11] However, the scope for continuation and expansion is subject to their competitive capabilities in not only world but also local markets.

Two solutions are suggested to market problems. The first is to widen markets through regional economic integration, the second is to emphasize on industrial integration within the same economy or region.

2. *The sectoral weights*

It is hard to determine appropriate sectoral weights because these depend on the respective contribution of production, labour force and exports to total GDP.

With respect to GDP, there are two approaches to determining sectoral weight. The first is based on the weight of sectoral production in the low price scenario. However, this depends on the maintenance of the current structure of the economy and on taking into consideration that any increase in the weight of the non-oil sectors will be mainly the result of an increase in Government production and similar activities or a decrease in the value of oil and gas production.

The second approach is based on the weight of those activities in the employment structure, and has the implicit target of raising the share of non-oil sectors in production so as to be consistent with their weight in the absorption of the labour force. This can be achieved by raising total factor productivity and expanding of fixed capital formation.

TABLE 17. THE RECOMMENDED PARTICIPATION WEIGHTS OF NON-OIL ACTIVITIES IN GENERATING GDP,* 2010 AND 2020
(*Percentage*)

Non-oil/ total GDP	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	United Arab Emirates
2010	0.78	0.71	0.74	0.65	0.8	0.76
2020	0.84	0.82	0.84	0.70	0.88	0.82

* Includes petrochemical industries.

C. GROWTH RATES OF TOTAL GDP AND NON-OIL GDP

The growth of GDP is calculated using the direct relation between per capita GDP and population growth derived from the exponential growth of both population and GDP. [$X_t = X_0 (1+\alpha)^n$]

TABLE 18. GDP GROWTH RATES IN 2010 AND 2020: MAINTAINING THE GOAL OF DOUBLING PER CAPITA GDP
(*Percentage*)

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	United Arab Emirates
2010	7.16	6.81	5.22	6.93	6.85	7.77
2020	6.61	6.21	5.10	6.61	6.61	7.23

[11] Inter-Arab Investment Guarantee Corporation, *taqrir manakh al-istithmar fi-l-duwal al-arabia li'am 1998*, (Kuwait, IAIGC, 1998), p. 7.

Estimations of average annual non-oil GDP growth rates will be affected by oil growth rates and certain calculated weights, as shown in table 19.

As was expected, the commonest oil price levels in this scenario are the low and stable prices.

Given the ambitious nature of the scenario, namely, to double the per capita GDP growth in non-oil sectors, prices will have to be comparatively high (see table 19).

If such high growth rates are to be achieved, high rates of investment will have to be attracted. Such investment is dependent upon capital/product coefficients, which vary according to sector and technology.

TABLE 19. EXPECTED ANNUAL GROWTH RATES OF NON-OIL SECTORS IN 2010 AND 2020
(*Percentage*)

	Version I		Version II	
Country	2010	2020	2010	2020
Bahrain	9.8	9.7	8.3	8.4
Kuwait	9.2	9.2	7.4	7.3
Oman	7.0	7.0	5.3	7.1
Qatar	7.0	7.4	7.3	7.0
Saudi Arabia	8.2	8.1	7.0	7.1
United Arab Emirates	9.0	9.0	8.6	8.8

Foreign trade is expected to have a positive balance. However, in most cases, the surplus will not represent a high percentage of GDP (see table 20). The expected positions take into consideration the impact of "autonomous imports".

Two import-related factors will have an effect, namely, the increase in imports and the natural increase related to population growth.

Part of the improvement in the trade balance can be explained by the increase in non-oil exports, albeit these remain moderate.

Non-oil exports may be increased if special arrangements and regulations are followed and the efficiency and competitiveness of GCC non-oil exports are improved.

TABLE 20. RATIO OF EXPECTED BALANCE OF TRADE TO GDP IN GCC STATES, 2010 AND 2020
(*Percentage*)

	Version I		Version II	
Country	2010	2020	2010	2020
Bahrain	0.02	7.00	0.01	8.90
Kuwait	3.40	3.70	10.00	7.80
Oman	(20.1)	(9.00)	(10.80)	(5.40)
Qatar	11.20	6.10	17.60	11.40
Saudi Arabia	(12.40)	(8.30)	(11.50)	(5.00)
United Arab Emirates	1.70	8.20	1.40	11.50

Note: ( ) indicates negative.

While the deficit in Oman and Saudi Arabia is expected to continue under the pressure of population growth and the rigidity of import behaviour, the ratio of deficit to GDP is, comparatively, less.

Annex I

MODEL BUILDING

Definitions

t- years

y- GDP at current prices

Y_0- oil GDP at current prices

Y_n- non-oil GDP at current prices

C- total household consumption

G- current Government expenditure

Ig- capital Government expenditure

I- gross private investment

V- increase/decrease in stocks

(F.O.B prices) E-total exports

Eo- total oil and gas exports

En- total non-oil exports

M- total imports

R- total budget revenues

OR- crude oil and gas revenues

TX- non-oil revenues

Dot- domestic use of oil products.

Balance relations

$Yt = Ct + Gt + It + Igt + Vt + Et – Mt$ (1),

$Yt = Yot + Ynt$ (2),

$Ynt = Y1t + Y2t + Y3t + \ldots\ldots Yit + \ldots. Yst$ (3),

$Ynt = Y1t + \Sigma^{s}_{i=2} Yit$ (3),

$Yot = Eot + Dot$ (4),

$Et = Eot + Ent$ (5),

$Rt = (OR)t + (TX)t$ (6),

Parameters of the model

c_1- marginal propensity to consume

e- proportion of non-oil exports to GDP $e = \frac{E_n}{Y_n}$ (7),

m- the inverse of export/import coverage coefficient = 1 ÷EXP/IMP.

ζ- denotes the ratio of non - oil revenues to total non - oil GDP (including taxes, fees and transfers of public sector profits to the public budget).

$\zeta = TX/Yn$ (8),

λ = the proportion of oil exports transferred to the public budget

$$\lambda = \frac{OR}{Eo} \quad (9),$$

λ is determined by decision makers, taking into consideration, *inter alia*, fiscal policy targets and the maintenance and expansion costs of oil production.

g = the ratio of current expenditure to total budget revenue

$g = \frac{G}{R}$ (decision variable) (10),

ig = the share of Government capital expenditure to total budget revenues Ig

$\frac{Ig}{R} = ig = (1-g)$ (11),

Behavioural relations

Consumption function

Analysis of consumption-income data shows that consumption depends mainly on current oil and non-oil income.

Despite the expansion in banking credits for consumption, the average propensity to consume is still comparatively low. But this does not rule out the possibility of testing "the life time hypothesis" for further modifications in the model, since credit policy is partially related to the increase in oil income. The consumption function is therefore assumed to be traditional.

$Ct = co + c1Yt$ (12),

Non-oil budget revenue

Judging by socio-economic and socio-political aspects, the tax role in mobilizing budget revenues is very limited and non-oil revenues with certain exceptions, depend on fees rather than taxes.

The increase in crude oil prices and revenues has had little impact on establishing and promoting tax bases and systems. Furthermore, social allowances, economic subsidies and Government grants, which are decision variables, affect the value of the behavioural tax relation.

Public sector profit transfers to the treasury may be neglected under the rapid privatization process.

$TX = \xi Yn$ (13),

Non-crude oil exports

With the exception of Saudi Arabia and Bahrain, the non-oil exports of most GCC States are of minor importance, and are mainly provided by services.

Most non-crude oil exports are oil products including refined oil and petrochemicals, which are subject to oil markets and prices, international oligopolies of petrochemicals and similar factors that affect crude oil and gas exports.

$$Ent = e\ Ynt \qquad (14),$$

Total imports

Total imports to 2000 did not put pressure on foreign currencies because oil exports and money reserves could cover import requirements.

During the period of the decline in oil price and revenue, import trends were not affected. Nevertheless, Bahrain, Oman, Qatar, and the United Arab Emirates became net foreign debtors.

In order to test the policy choice reference scenario, it is preferable to follow the same behavioural relations between exports and imports

$$Mt = mEt = m\ (Eot + Ent) \qquad (15),$$

Total domestic uses of oil product (Do)

Total domestic use of oil product is technically related to both oil and non-oil GDP.

The volume of Do is a function of Y and V

$$Dot = \alpha 1\ Yt + \alpha 2\ Vt$$

$$Dot = \alpha 1 Yt + \alpha 2\ v\ Yt = (\alpha 1 + \alpha 2\ v)\ Yt \qquad (16),$$

$$= d\ Y_t$$

Where $d = \alpha 1 + \alpha 2\ v$

Decision-making relations

$$(OR)_t = \lambda\ E_{ot} \qquad (17),$$

$$G_t = g\ R_t = g\ [(OR)_t + (TX)_t] \qquad (18),$$

$$Igt = i_g\ Rt = (1-g)\ [(OR)_t + (TX)_t] \qquad (19),$$

$$V_t = v\ Y_t \qquad (20),$$

Derivation of the reduced form of the model

Given the balance equation (1)

$$Y_t = C_t + G_t + I_t + I_{gt} + V_t + E_t - M_t$$

For simplicity assume (15) be of the form $M_t = m\ E_t$

Replacing the values of (C, G, Ig, V, M) from (12,18,19,20,15) in (1) we get:

$Y_t = c_0 + c_1 Y_t + g R_t + (1-g) R_t + v Y_t + E_t - mE_t + I_t$

$Y_t - c_1 Y_t - v Y_t = c_0 + R_t + E_t (1- m) + I_t$

$Y_t (1-c_1-v) = c_0 + R_t + (1-m) E_t + I_t$

$$Yt = \frac{1}{1-c_1-v}\{c_0 + R_t + (1-m) E_t + I_t\} \quad (21)$$

However,

$Rt = (OR) t + (TX)t$

$R_t = \lambda E_{ot} + \zeta Y_{nt}$

$Y_{nt} = Y_t - Y_{ot} = Y_t - \{E_{ot} + D_{ot}\}$

$R_t = \lambda E_{ot} + \zeta [Y_t - (E_{ot} + D_{ot})]$ (22)

$R_t = E_{ot} (\lambda - \zeta) + \zeta Y_t - \zeta D_{ot}$ (22)

Replacing R_t from (22)' in (21)

Then

$Y_t (1-c_1-v) = c_o + (\lambda - \zeta) E_{ot} + \zeta Y_t - \zeta D_{ot} + (1-m)E_t + I_t$

$Y_t (1-c_1-v- \zeta + \xi d) = c_o + (\lambda - \zeta) E_{ot} + (1-m) (E_{ot} + E_{nt}) + I_t$

$Y_t (1-c_1-v- \zeta + \xi d) = c_o + (1+\lambda - m- \zeta) E_{ot} + (1-m) E_{nt} + I_t$

$Y_t [1-c_1-v-\zeta(1-d)] = c_o + (1+\lambda - m- \zeta) E_{ot} + (1-m)e\, Y_{nt} - \zeta D_{ot} + I_t$ (23)

Substituting Y_n by its value in (21)

$Y_t [1-c_1-v- \zeta (1-d) - (1-m) e] = c_o + \{1+\lambda - m- \zeta) E_{0t} - (1-m) e\{E0t + D_{0t}\} + I_t$ (24)

Substituting D_{ot} from (24)

$Y_t \{1-c_1-v- \zeta (1-d) - (1-m) e\} = c_o + E_{ot} \{(1-m)(1-e) + \lambda - \zeta\} + I_t - \{e (1-m) d\} Y_t$

$Y_t [1- c_1 -v- \zeta (1-d) - (1- m) e + d (1-m)e\}] = c_o + E_{0t} \{(1-m)(1-e) + (\lambda - \zeta)\}] + I_t$ (25)

Therefore, $Y_t [1 - c_1 - v - \zeta (1 - d) - (1- m) e (1 - d)] = c_0 + \omega E_{0t} + I_t$ (25)'

Where, $\omega = (1 - m) (1 - e) + (\lambda - \zeta)$

Relation (25) can be summarized as

$Y_t [1- c_1 -v- (1-d)\{\zeta - e (1-m)\}] = co + \omega E_0 + I_t$

Let $\sigma = [1- c_1 -v- (1-d)\{ \zeta - e (1-m)\}] = \sigma$ (26)

Therefore, $\sigma Y_t = c_0 + \omega E_{0t} + I_t$

Thus, $Y_t = 1 / \sigma [co + \omega E_{0t} + I_t]$

Annex II

PROJECTED GDP VALUES IN 2010 AND 2020 WITHIN ALTERNATIVE PRICE SCENARIOS

ONE HUNDRED PER CENT OF PRODUCED QUOTA IS EXPORTED

Country	Low price scenario	Stable price scenario	Medium price scenario	High price scenario
	Year 2010			
Bahrain	1 751.11	2 070.00	2 707.00	3 356.90
Kuwait	8 917.80	11 501.20	16 669.00	21 937.90
Oman	10 104.50	14 346.00	18 993.50	27 208.10
Qatar	26 744.28	33 609.34	50 119.90	61 345.59
Saudi Arabia	764 450.04	953 287.64	1 331 059.19	1716 228.51
United Arab Emirates	128 718.40	163 079.00	229 894.70	301 901.00
	Year 2020			
Bahrain	2 325.50	2 702.20	3 456.00	4 258.00
Kuwait	10 648.90	13 527.40	19 843.30	25 036.20
Oman	12 809.70	15 511.10	22 520.20	29 802.50
Qatar	32 417.00	40 530.50	56 772.60	75 487.54
Saudi Arabia	970 869.72	1 194 021.90	1640 794.00	2 104 987.00
United Arab Emirates	142 388.60	182 993.00	264 287.00	348 750.90

EXPORTS LOWER THAN PRODUCTION QUOTAS

Country	I	II	III	IV
	Year 2010			
Bahrain	2 930	3 658	4 961	6 594
Kuwait	23 130	30 640	45 659	60 975
Oman	4 316	24 056	31 746	41 737
Qatar	11 698	10 561	16 648	20 015
Saudi Arabia	337 260	378 053	459 659	542 864
United Arab Emirates	85 071	92 336	106 467	121 697
	Year 2020			
Bahrain	3 507	4 312	5 917	7 587
Kuwait	24 669	32 503	49 743	80 103
Oman	20 532	24 710	35 544	46 803
Qatar	14 978	16 825	22 298	26 453
Saudi Arabia	72 131.6	515 784.6	603 182.6	693 988.5
United Arab Emirates	132 169	139 956	15 554	171 745

Annex III

BALANCE OF TRADE

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	United Arab Emirates
Year 2010						
Low price scenario	(233.7)	(608.1)	(2 164)	6 376.3	(7 742.1)	(110 016)
Stable price scenario	(474)	715.3	(722.5)	11 400	(5 087.3)	(88 389)
Medium price scenario	(91.5)	3 363	857.3	2 159.4	102 667.4	(46 335)
high price scenario	4 298.7	6 062	2 911.1	31 700	287 256.8	(1 014)
Year 2020						
Low price scenario	(978.6)	(1 597.2)	(2 146.1)	5 609.8	(143 197.7)	(170 353)
Stable price scenario	(752.5)	(2.5)	(1 227.9)	11 547	(627 343.3)	(144 804)
Medium price scenario	(300)	3 219.4	1 154.4	23 434	105 683.2	(93 630)
high price scenario	170.2	6 414.8	3 629.6	35 191	280 738.7	(40 467)

Note: ( ) indicates negative.

Annex IV

THE EXPECTED PUBLIC FINANCE SITUATION

Scenario versions	I		II		III		IV	
	2010	2020	2010	2020	2010	2020	2010	2020
Bahrain								
Expenditure (total)	955	1 285	955	1 285	955	1 285	955	1 285
Revenue (total)	505	596	662	719	974	1 151	1 293	1 536
Oil	421.6	480	568	652.5	860	998	1 158	1 358
Non-oil	83.4	117	94	93.5	114	153	135	178
Deficit or surplus	(450)	(688)	(293)	(566)	19	(134)	338	251
Deficit or surplus as percentage of GDP	25	29.6	14.2	21	0.011	3.9	0.05	7.5
Kuwait								
Expenditure (total)	6 395	8 430	6 395	8 430	6 395	8 430	6 395	8 430
Revenue (total)	3 318	3 780	4 463	5 056	6 752	7 841	9 088	10 643
Oil	3 265	3 715	4 397	4 976	6 659	7 729	8 968	10 510
Non-oil	53	65	66.5	80	93	112	120	133
Deficit or surplus	(3 077)	(4 650)	(1 932)	(3 374)	35.7	(589)	2 693	2 213
Deficit or surplus as percentage of GDP	34.5	(43.7)	29.2	2.5	2.4	5.2	12.3	8.8
Oman								
Expenditure (total)	2 722	3 160	2 722	3 160	2 722	3 160	2 722	3 160
Revenue (total)	2 543	3 179	3 705	3 918	4 978	4 990	6 630	7 830
Oil	2 048	2 522	3 065	3 169	4 180	4 849	5 625	6 593
Non-oil	495	657	640	750	798	141	1 005	1 237
Deficit or surplus	(179)	19	983	758	2 256	1 830	3 908	4 670
Deficit or surplus as percentage of GDP	1.9	0.001	12.6	5.4	14.3	9.5	19.3	19

Note: ( ) indicates deficit.

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