A MACROECONOMETRIC MODEL OF THE RESPONSE OF ASIAN DEVELOPING ECONOMIES TO EXTERNAL SHOCKS

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CHAPTER I

INTRODUCTION

Purpose of the Study

Economic conditions in the industrial countries have been very unstable during the last two decades. The two oil shocks of the 1970s led to recession, growing protectionism and credit rationing in the industrial world which had spillover effects on developing nations. Therefore, it is crucial to study how changes in the external economic environment, especially in industrial countries, affects the developing economies. However, most of the research in this area is either the narration of 'stylized facts' or analysis based on single equation regressions.[1] When analysis is restricted to single equation models, essential features of interdependence between developed and developing countries are ignored. Some studies that have used a multi-equation model discuss only a few macroeconomic linkages between developing countries and the rest of the world.[2] The present study uses a multiequation model in order to capture the linkages between developed and developing economies. In particular, it investigates the impact of external shocks on the economies of South/South East Asia.

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[1] See James (1983), Naya, Kim and James (1984), Taylor, McCarthy and Alikhani (1984), Dornbusch (1985), (1986), Goldsbrough and Zaidi (1986), Campbell (1987).

[2] Studies like Mercenter and Waelbroeck (1984) and Schadler (1986) used multiequation models.

Some Background Notes

Industrial countries experienced severe recessions after the two oil price shocks of the 1970s. As a result, nonoil developing countries suffered sharp declines in the demand for their goods in their principal export markets and widening balance of payments deficits. According to James (1983, pp. 8-56) and Bond (1987, pp. 196-197), Asian developing countries (ADCs) were least affected, in contrast to Africa, Middle East and the Western Hemisphere. Therefore, it is of interest to investigate the factors which led to the superior performance of the ADCs. Macroeconomic performance between ADCs has varied widely. Outward looking, trade oriented nations in east and south-east Asia had much higher average real growth rates, in per capita terms, than the populous south Asian countries. As Naya, Kim and James (1984, p. 1) point out, ADCs with similar economic characteristics responded to external shocks in a broadly similar way. For this reason, in this study the ADCs are divided into three groups based on their stage of development and structural differences. Constrained by the availability of data, this study includes ten ADCs. Using GNP per capita as the criterion, they are divided into three groups: (i) three oil importing newly-industrialized countries: Republic of Korea, Malaysia and Singapore (Group I); (ii) three middle income, partly-industrialized nations: The Philippines, Thailand, and Indonesia (Group II); and (iii) four predominantly agrarian, oil-importing nations: Pakistan, India, Nepal and Sri Lanka (Group III).[3]

[3] Country groupings are taken from James (1983).

Key Economic Developments in ADCs, 1968-1989[4]

Recent Performance

In order to compare the relative economic performance of ADCs, their basic structural and economic differences are discussed. The three main groups of ADCs can be distinguished by income level and by overall economic performance. Table I shows the basic economic indicators for ADCs for the year 1989, and Figure 1 presents information on per capita GNP.

The initial conditions of the ADCs varied greatly. Their resource endowments, size, and terrain are strikingly different. Per capita GNP of Group I countries varied from $2,160 to $10,450. Within Group I, Korea and Malaysia have large, in comparison to Singapore, populations of 42 and 17 million respectively. Thailand and Philippines of Group II are classified as middle-income countries, whereas Indonesia as low-income country by the World Bank in 1991. Per capita GNP of Group II range from $500 to $1,220. Indonesia is the second largest of the sample countries (after India) in terms of both land area and population.

Group III countries are all low-income countries, with per capita GNP ranging from $180 in Nepal to $430 in Sri Lanka in 1989. In addition to India's 833 million people, 110 million are in Pakistan and less than 19 million in Nepal and Sri Lanka.

The sample countries are diverse in terms of urban population. They include extremely large and populous India and tiny city-state Singapore (Figure 2). Group I countries generally have proportionally

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[4] The analysis is based on James (1983), Aziz (1990) and James, Naya and Meir (1989).

TABLE I

BASIC INDICATORS FOR ASIAN DEVELOPING COUNTRIES, 1989

Country	Area (1000 Sq Km)	Agricultural Land (% of Total)	Population mid 1989 (Mill)	Urban Population (% of Total)	GNP per Capita (U.S. $)
Singapore	0.6	5	2.7	100	10,450
Korea	99.0	23	42.4	71	4,400
Malaysia	329.8	13	17.4	42	2,160
Thailand	513.1	41	55.4	22	1,220
Philippines	300.0	30	60.0	42	710
Indonesia	1904.6	17	178.2	30	500
Sri Lanka	65.6	35	16.8	21	430
Pakistan	796.1	32	109.9	32	370
India	3287.6	55	832.5	27	340
Nepal	140.8	31	18.4	9	180

Source: World Bank, World Development Report 1991 (New York: Oxford University Press, 1991, World Development Indicators: Table 1).

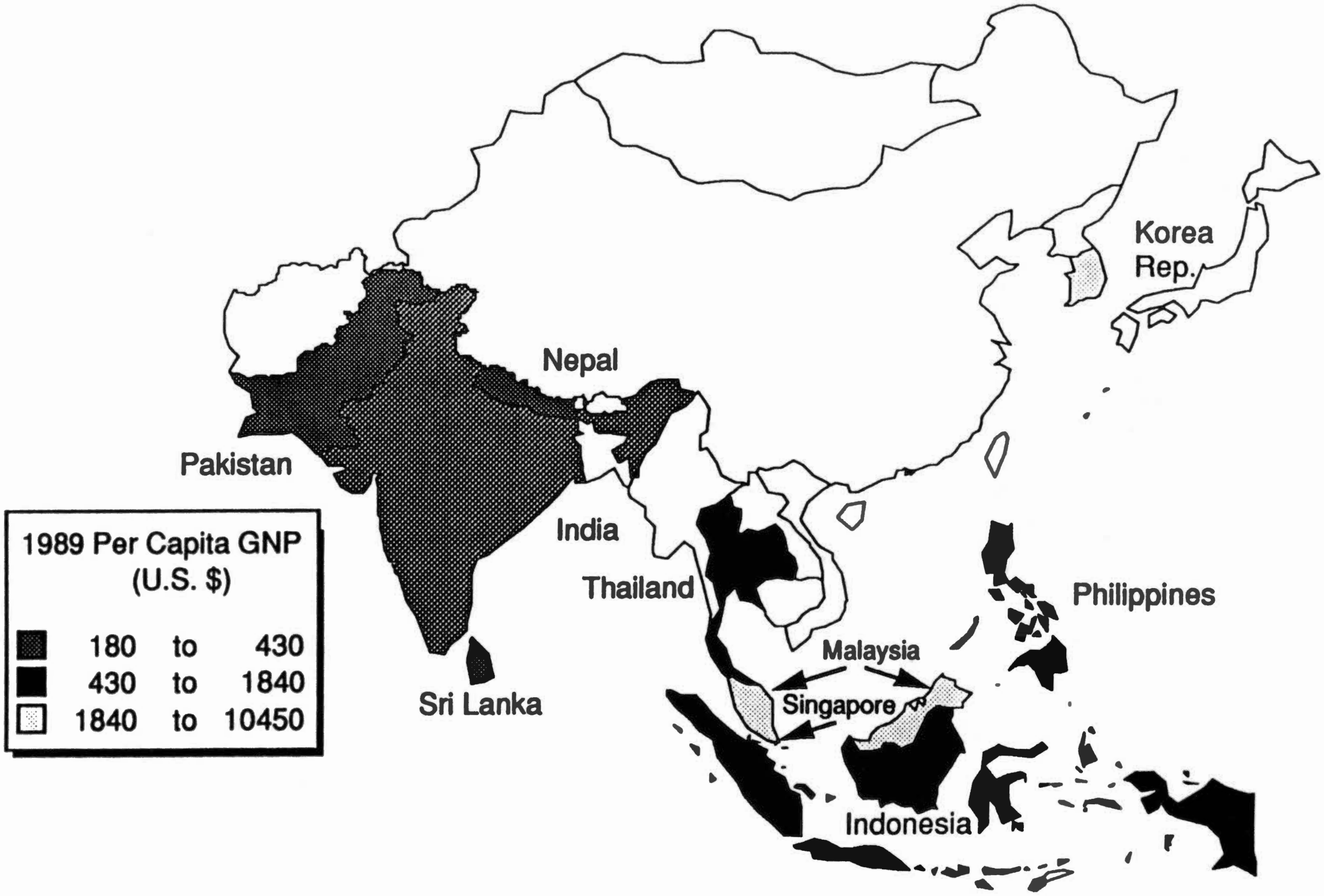

Figure 1. Asian Developing Countries--Per Capita GNP

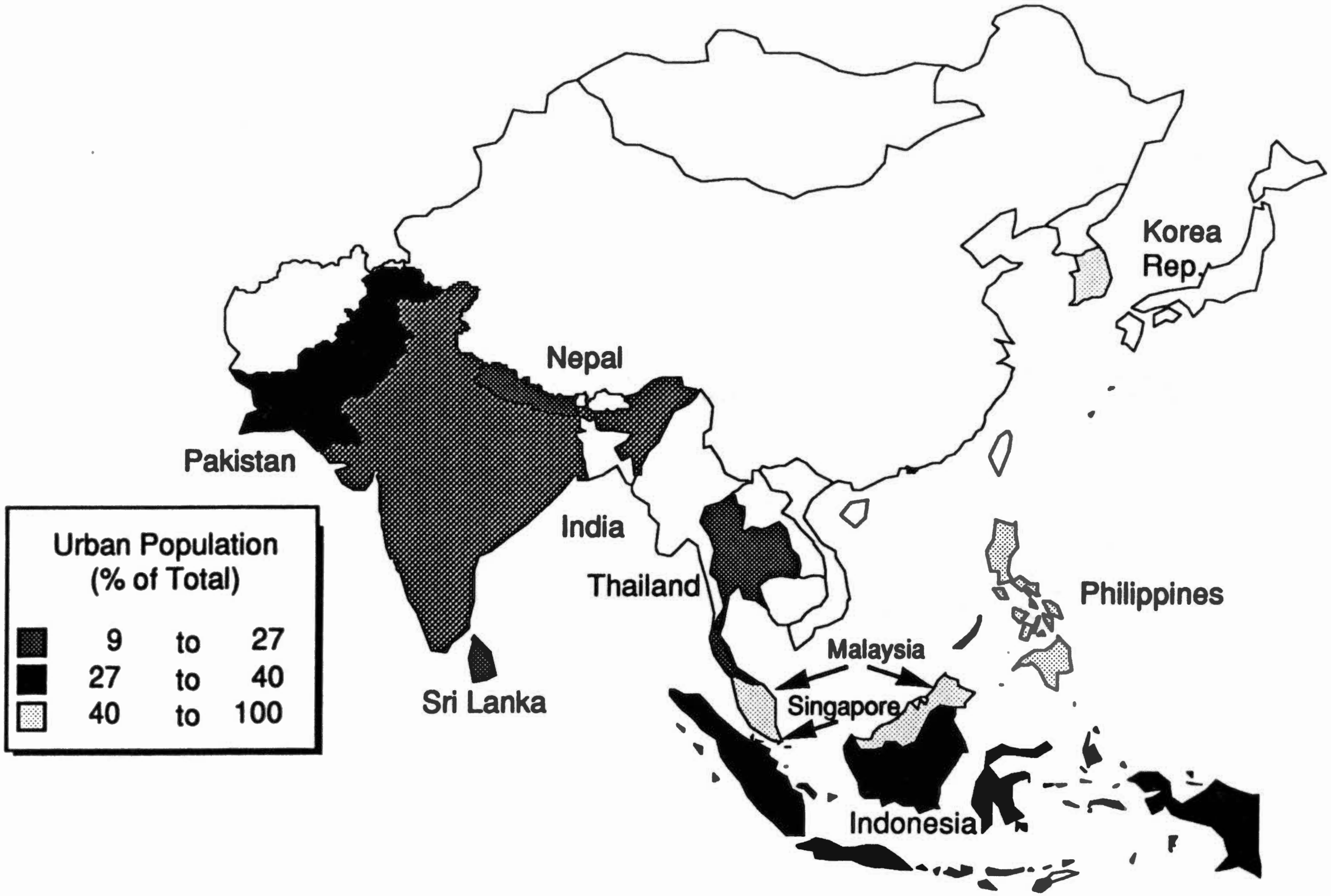

Figure 2. Asian Developing Countries--Urban Population

higher urban population than other sample countries (Table I). As James, Naya and Meir (1989, p. 9) state, "Nepal is a mountainous, land-locked country; Indonesia and the Philippines are vast archipelagic nations. Malaysia is thinly populated". Group III countries are predominantly agricultural, in contrast to the emerging industrialized countries of Group I, as evidenced by their proportion of land devoted to agriculture (Table I). The sample countries differ politically as well. Some struggled for national independence--Indonesia, Korea, India, Pakistan. Some were more or less granted independence--Malaysia and the Philippines. Other were never successfully colonized--Thailand [James, Naya and Meir (1989, p. 9)].

Table II shows international trade flows for the sample countries during 1989. The share of exports plus imports in GDP measures a country's openness. Except for Sri Lanka, the share of exports plus imports in GDP of Group III is much smaller than that of the other groups. The less open economies are less affected by the ill effects of world recession, but benefit less from an upturn in world economic activity (Aziz 1990, pp. 75-77).

Composition of merchandise exports also affected the economic performance of the ADCs. Table III shows the structure of merchandise exports of the ADCs in 1989. Singapore and Korea are the least dependent on non-fuel primary commodities, in contrast to Thailand and Sri Lanka. Among the ADCs, Indonesia and Malaysia are the major exporters of oil and gas. Of all the countries in the sample, Indonesia is most heavily dependent on the export of primary commodities: 68 percent of export earnings came from commodity exports. Malaysia (56

TABLE II

INTERNATIONAL TRADE FLOWS, 1989
(MILLIONS OF U.S. DOLLARS)

Country	Total Exports (Mill $)	Total Imports (Mill $)	GDP (Mill $)	Exports Plus Imports (% of GDP)
Singapore	44600	49605	28360	332
Korea	62283	61347	211880	58
Malaysia	25053	22496	37480	127
Thailand	20059	25768	69680	66
Philippines	7747	10732	44350	42
Indonesia	21773	16360	93970	41
Sri Lanka	1554	2229	6340	60
Pakistan	4642	7119	35820	33
India	15523	19215	235220	15
Nepal	156	580	2810	26

Source: World Bank, World Development Report 1991 (New York: Oxford University Press, 1991, World Development Indicators: Table 3 and 14).

TABLE III

STRUCTURE OF MERCHANDISE EXPORTS, 1989
(In Percent)

Country	Fuels, Minerals, & Metals	Other Primary Commodities	Machinery & Transport Equipment	Textiles & Clothing	Other Manufactures
Singapore	18	9	47	5	21
Korea	2	5	38	23	32
Malaysia	19	37	27	5	12
Thailand	3	43	15	17	22
Philippines	12	26	10	7	45
Indonesia	47	21	1	9	22
Sri Lanka	3	43	4	38	12
Pakistan	1	33	0	54	12
India	8	19	7	23	43
Nepal	0	13	3	73	11

Source: World Bank, World Development Report 1991 (New York: Oxford University Press, 1991, World Development Indicators: Table 16).

percent), Thailand (46 percent) and Sri Lanka (46 percent) were also predominantly primary commodity exporters in 1989.

Although primary commodity exports play a major role in some ADCs, exports of manufactures are also important. Manufactures exports, however, are of the sophisticated/high technology type for Group I countries. Most of the manufactures exports of Group III countries consist of textile and clothing which rely on labor-intensive technology.

In addition to openness, destination of merchandise exports also shows the degree of exposure of a country to external influences. Table IV shows the destination of exports of ADCs. We shall discuss this table at greater length in the next section. It should be noted here, however, that most of the ADCs are highly dependent on the industrial countries for their exports. Thus, changes in the economic situation of industrial countries should greatly affect the sample countries. In addition, intra-ADC is significant especially for Malaysia (33 percent), Singapore (25 percent) and Nepal (36 percent) during 1988.

OECD During 1965-1989

During the late 1960s and early 1970s inflation rose worldwide. In OECD countries, inflation rates, as measured by consumer prices, tended to rise despite reduced rates of economic growth during 1970. Vigorous growth in OECD countries gave rise to the commodity boom of 1973.

Oil prices rose by over 260 percent in October 1973. That was accompanied by a general rise in commodity prices, particularly of foodstuffs. Average GNP growth in OECD fell from 6.1 percent during

TABLE IV

DESTINATION OF MERCHANDISE EXPORTS
(In Percent)

Country	Asian[a] Developing Countries			Industrial[b] Countries			Oil[c] Exporting Countries		
	1973	1980	1988	1973	1980	1988	1973	1980	1988
Singapore	23.5	26.5	25.3	47.9	37.9	49.1	2.0	7.2	2.6
Korea	2.9	8.2	6.4	84.0	63.3	73.9	1.4	11.9	4.2
Malaysia	27.7	27.4	32.9	54.8	58.8	52.1	1.1	2.1	2.3
Thailand	21.5	17.8	15.4	56.4	57.4	61.4	2.2	7.9	5.9
Philippines	3.5	10.5	10.2	89.6	74.8	76.8	0.1	1.8	1.3
Indonesia	11.1	14.3	6.6	74.2	77.1	41.6	0.0	0.4	13.8
Sri Lanka	7.9	8.5	9.8	29.2	38.5	57.6	0.0	22.0	17.2
Pakistan	15.8	7.2	10.3	44.8	35.7	56.2	10.2	24.4	10.4
India	5.0	6.7	15.7[d]	54.3	47.8	71.1[d]	6.2	12.3	2.6[d]
Nepal	. .	54.6[e]	35.6	. .	26.1[e]	62.1	. .	0.2[e]	0.1

Source: International Monetary Fund, Direction of Trade Computer Tape, 1990.

[a]Asian Developing Countries are Singapore, Korea, Malaysia, Thailand, Philippines, Indonesia, Sri Lanka, Pakistan, India and Nepal.

[b]Industrial Countries are United States, United Kingdom, Belgium, Denmark, France, Germany, Italy, Netherlands, Sweden, Switzerland, Canada, Japan, Spain, Australia.

[c]Oil Exporting Countries are Bahrain, Iran, Iraq, Jordan, Kuwait, Saudi Arabia, Yemen, Syria, United Arab Emirates, Egypt, Algeria, Libya and Nigeria.

[d]1986

[e]1981

1973 to less than 1 percent during 1974 and became negative the following year. Following the oil shock of 1973-1974, OECD inflation rates were increasing by an average of over 8 percent a year in the late seventies. Real OECD GDP growth rose to 4.9 percent in 1976, pulled along by a strong recovery in the U.S. However, it declined to an average 3.7 percent in 1977 and 1978.

During 1979-1980 another oil price increase occurred. Average real GDP growth of the OECD countries fell slightly from 3.7 percent in 1978 to 3.3 percent in 1979 and inflation rose from 8 percent to 9.8 percent. In 1980, the real growth rate fell substantially in some of the OECD countries and inflation rates climbed to the double digit range.

Tight fiscal and monetary policies were adopted in early 1980s to halt inflation. This resulted in a recession, followed by sharply declining commodity prices, including steep drops in oil prices in 1983 and 1986. This recession also resulted in increasing protectionism by the developed countries on imports from developing countries, especially on labor-intensive manufactures like textiles and clothing (James 1983, p. 2). Significant credit rationing took place during the 1980s, as capital-exporting countries faced economic downturn.

Adjustments in ADCs During 1965-89

The external shocks discussed in the previous section, posed a number of economic problems for all developing countries. However, the ADCs were more successful than other developing countries in adjusting to these external imbalances. Table V compares the GDP growth for selected country groups. It shows that Asian countries as a whole were able to maintain a higher growth rate of real GDP, despite the two oil

TABLE V

AVERAGE ANNUAL GROWTH OF REAL GDP
IN SELECTED COUNTRY GROUPINGS
(In Percent)

Country Group	1965-73	1973-80	1980-89
Sub-Saharan Africa	4.8	3.2	2.1
East Asia	8.1	6.6	7.9
South Asia	3.6	4.2	5.1
Latin America and the Caribbean	6.5	5.0	1.6
OECD Countries	4.7	3.0	3.0
Oil Exporters(excluding USSR)	8.3	3.7	0.8

Source: World Bank, World Development Report 1991 (New York: Oxford University Press, 1991, Statistical Appendix: Table A.6).

price shocks and recession in the industrial countries. Performance, however, differs between the Asian countries. The East Asian countries have the highest GDP growth in comparision to all other country groupings.

The individual economic performance of the ADCs included in this study is shown in Table VI. During 1965-80, Group I countries grew the fastest (7-10 percent a year), followed by Group II countries (6-7 percent), and Group III countries (2-5 percent). Compared to the average growth rates for all developing countries, the growth rates for Group I and Group II countries were above the average, while those of Group III countries were below the average and all except Nepal grew faster than the OECD countries. During 1980-89, growth in both Group I and Group II countries fell. However, average GDP growth in Group III accelerated, overtaking the average for all developing countries and the OECD countries.

The average rate of inflation of the developing countries showed an upward trend from 1965-80 to 1980-89. Except for Philippines, Sri Lanka, India and Nepal, all other ADCs were able to reduce their average inflation rate during 1980-89 as compared to 1965-80. In India, the inflation rate remained constant at 7.7 percent a year. During 1980-89 the average inflation rate of all developing countries was 53.7, while in ADCs it was much lower (ranging from 1.5 to 14.8 percent). Even in Philippines, with the highest rate among ADCs, inflation was less than half the average for developing countries. It can be noted that with the exception of Korea during 1965-80, the inflation rate in Group III was generally higher than the Group I countries.

TABLE VI

REAL GDP GROWTH AND INFLATION RATE
IN ASIAN DEVELOPING COUNTRIES
(In Percent)

	GDP[a]		Inflation Rate[b]	
Country	1965-80	1980-89	1965-80	1980-89
Singapore	10.0	6.1	5.1	1.5
Korea	9.9	9.7	18.4	5.0
Malaysia	7.4	4.9	4.9	1.5
Thailand	7.3	7.0	6.2	3.2
Philippines	5.9	0.7	11.7	14.8
Indonesia	7.0	5.3	35.5	8.3
Sri Lanka	4.0	4.0	9.4	10.9
Pakistan	5.2	6.4	10.3	6.7
India	3.6	5.3	7.5	7.7
Nepal	1.9	4.6	7.8	9.1
Developing Countries	5.8	3.8	16.7	53.7
OECD	3.8	3.0	7.5	4.3

Source: World Bank, World Development Report 1991 (New York: Oxford University Press, 1991, World Development Indicators: Table 2).
[a]Average annual growth in GDP.
[b]Average annual rate of inflation as measured by GDP deflator.

The purpose of this study is to investigate the factors behind the superior and diverse performance of the ADCs. Much of the research has shown that ADCs adjusted to the series of external shocks during the last two decades in a number of ways. First, they diversified their exports toward more dynamic manufactured goods. Second, as a result of increasing protectionism and recession in industrial countries, the ADCs diversified their export markets. Table IV shows that most of the ADCs were able to divert their exports to booming oil exporting economies between 1973 and 1980. However, as these countries experience a downturn in economic activity, the export share to these markets declined. Third, the ADCs increased the flow of external finance. Table VII shows that Group I countries in general receive more commercial loans than the Group III countries. Thus, the relative prevalence of commercial loans results in a more efficient use of foreign capital in the Group I countries to satisfy growing development needs. Group III, in addition to receiving a greater share of concessional loans, finance its growing investment and current account deficits by workers' remittances from rich oil exporting countries (Table VII and Table VII). Fourth, the ADCs raised the prices for petroleum products. After the two oil shocks, some countries, primarily in Group I, raised their domestic oil prices and thus suffered little reduction in economic growth and were successful in energy conservation and substitution away from oil (James 1983). However, most countries in Group III, in contrast to Group I, did not raise domestic oil prices. Some countries, like Pakistan, even received petroleum at a subsidized rate from friendly, oil-exporting countries. In the long run, growing fuel demand hampered economic growth in Group III countries.

TABLE VII

DISBURSEMENTS OF FOREIGN CAPITAL IN ASIAN DEVELOPING COUNTRIES (In Percent)

	Official			Private			Commercial Banks			Concessional		
Country	1970	1980	1988	1970	1980	1988	1970	1980	1988	1970	1980	1988
Singapore	62.2	53.5	3.0[a]	37.8	46.5	97.0[a]	22.2	31.3	79.8[a]	. .	. .	. .
Korea	44.7	26.7	42.8	55.3	73.3	57.2	11.1	35.6	34.0	28.8	5.2	15.4
Malaysia	63.0	20.8	19.4	37.0	79.2	80.6	9.5	50.2	53.2	35.5	7.7	8.2
Thailand	97.5	48.1	42.7	2.5	51.9	57.3	1.6	47.1	26.8	33.6	14.6	24.1
Philippines	92.2	33.3	89.6	7.8	66.7	10.4	7.1	48.0	0.6	52.7	8.6	58.9
Indonesia	49.0	44.3	65.9	51.0	55.7	34.1	19.8	39.7	21.6	47.9	25.1	23.9
Sri Lanka	68.1	64.4	87.4	31.9	35.6	12.6	0.0	21.2	6.2	57.6	63.9	81.5
Pakistan	94.9	75.6	96.8	5.1	24.4	3.2	0.0	9.6	2.1	90.3	61.9	55.1
India	98.5	80.2	60.5	1.5	19.8	39.5	0.2	17.4	28.1	94.9	69.6	27.9
Nepal	100.0	100.0	71.1	0.0	0.0	28.9	0.0	0.0	0.0	97.5	100.0	71.1

Source: World Bank, World Debt Tables Computer Tape, 1990.
[a]1985

TABLE VIII

BALANCE OF PAYMENTS
IN ASIAN DEVELOPING COUNTRIES
(MILLIONS DOLLARS)

Country	Current Account Before Official Transfers 1970	Current Account Before Official Transfers 1989	Net workers' Remittances 1970	Net workers' Remittances 1989
Singapore	-585	2407	. .	. .
Korea	-706	5008	. .	0
Malaysia	2	-239	178	355
Thailand	-296	-2652	. .	. .
Philippines	-138	-1822	. .	360
Indonesia	-376	-1540	. .	125
Sri Lanka	-71	-546	3	338
Pakistan	-705	-1943	86	1902
India	-590	-8038	80	2650
Nepal	-25	-308	. .	0

Source: World Bank, World Development Report 1991 (New York: Oxford University Press, 1991, World Development Indicators: Table 18).

The economic development in ADCs during the last two decades indicates that different country groups responded in different ways to the external shocks during 1970s and 1980s.

Outline of the Dissertation

The dissertation is organized as follows. A brief discussion of previous studies and the description of the macroeconometric model used in this study is presented in Chapter II. The regression and basic simulation results are reported and discussed in Chapter III. Finally, Chapter IV provides a summary of the conclusions as well as recommendations for further research.

CHAPTER II

MACROECONOMETRIC MODEL

Introduction

There has recently been renewed interest to study macroeconomic linkages between developed and developing countries in the world economy. The conventional view is that a fall in the growth rate of industrial countries lowers import demand from all sources, including that from non-oil developing countries. This results in lower export growth in non-oil developing countries, which in turn reduces their growth rates.

Khan and Goldstein (1982) studied these linkages. They examine the key relationship between the rate of economic growth in the non-oil developing countries and that in the industrial countries during 1973-80. They find that the growth rates of industrial countries are not the only determinants of growth rates in non-oil developing countries. There are other factors which strongly affect non-oil developing country growth such as commodity composition and relative competitive position of their exports, tariff and nontariff barriers on exports to industrial countries and availability and cost of external finance, etc. The growth of real GDP of different groups of non-oil developing countries was regressed on industrial countries' real GDP growth rate for the period 1965-80. They find a striking difference on how slower industrial growth affected non-oil developing countries across groups. Net oil exporter and low-income countries were less sensitive to industrial country real growth than middle-income countries. Four factors help to protect the real GNP growth in non-oil developing countries in the face of harsh external environment characterized by low industrial country growth rate, high global inflation rates, and large oil price increases. They are: (i) increase in workers' remittances, particularly those in low-income; (ii) increased availability of external financing; (iii) orientation and quality of their own economic policies; and (iv) changing structure of production and exports.

Wallich (1981) analyzes the adjustment experience of the low-income Asian countries (Bangladesh, India, Maldives, Nepal, Pakistan, and Sri Lanka) after the external shocks of 1970s. Adjustment experience, nature and impact of external shocks are analyzed using stylized facts. The growth shortfall was largest in the first half of the 1970s. Economic growth picked up in the latter half of the decade. Reasons are terms of trade improvement in the latter half of the decade, flow of workers remittances and less dependence on oil imports during 1974. Population of the region grew at 2.1%, as a result per capita income grew at about 1.7% in 1970s. The region is largely agricultural. Investment rates are high and have small, but broad base industrial sectors. Close to one half of the region's exports consist of manufactures. Trade is a relatively small fraction of GDP. Dependence on primary products remains high. Imports consist largely of manufactured goods. The share of fuel imports has been rising. In most years, low-income Asian countries have been food importers. Exports grew most rapidly in the 1970s. Imports grew at 2.8% per year. Current account deficit as a percentage of GDP is relatively low both due to the dominance of India, a relatively closed economy, and workers remittances. Debt services ratios fell substantially over the decade. External shocks were accompanied by internal shocks, such as harvest failures, political instability, etc. Prices, more than export volume, have been the primary source of external shocks. Export performance worsened due to slower growth in OECD and adverse price trends. Growth performance was better because of higher manufactures exports and market outside OECD. Share of low-income Asia's exports in the exports of all oil-importing developing countries remain relatively constant during the decade. External shocks are quantified by comparing the actual magnitudes with the trend values. It shows that for low-income Asia, there is a weak relationship between the magnitude of the external shock and growth performance. External financing has been a very important factor. Export performance, import substitution, and balance of payments accommodations contributed very little to overall adjustment.

Hasan (1982) analyzes the economic performance of five East Asian countries namely Korea, Thailand, The Philippines, Malaysia and Indonesia during the 1970s. This paper reviews the nature and magnitude of structural adjustment, each of these countries face. He provides a summary evaluation of economic performance during the 1970s and highlights the key causes of success. Countries in East Asia perform remarkably in terms of growth of GNP per capita. Structural change has generally been more swift in East Asia than in any other developing group country. Almost all of these countries are more open than average middle-income countries, as shown by the ratio of exports to GNP. Growth in manufactures exports are the most dynamic factor in export expansion. Economies of East Asia were able to increase their market share relative to other developing countries, due to their domestic policies of not protecting the domestic industry. The major oil importers in the region Korea, The Philippines and Thailand were hard hit by the sharp rise in oil prices during 1973. However, all these countries experienced growth rates in GNP higher during 1974-79 than 1964-73. It was because the adjustment was shown mainly by large current account deficits of these countries.

Balassa (1986) reports the results of research on the policy responses of developing countries to exogenous (external) shocks in the 1973-78 and 1978-83 periods. These shocks included: (i) terms-of-trade effects, associated largely with increases in oil prices; (ii) export volume effects, resulting from the recession-induced slowdown in world trade; and (iii) during the second period, interest rate effects, due to the increase in interest rate in world financial markets. Although outward-oriented countries suffered considerably larger external shocks than inward-oriented countries, these differences were offset as a result of the policies followed. Thus while the outward-oriented countries accepted a temporary decline in GNP growth rates in both periods in order to limit reliance on foreign borrowing, their economic growth accelerated subsequently, owing to the output-increasing policies applied.

Naya, Kim and James (1984) examines the impact of oil price increases and world recession in 1970s on the balance of payments of 12 developing countries in Asia. The effects of external shocks on balance of payments are twofold: deterioration in the terms of trade and constraint on the volume of exports as a result of recession-induced falling incomes and the reduction of aggregate demand in industrial countries. The impact of the external shock can be measured by comparing the historical experience to that in the absence of the shocks. The magnitude of the shocks was estimated by measuring the effects on the balance of payments in relation to total national output. The average adverse effect was greatest for the newly-industrialized countries (NICs) and smallest for the South Asian group. NICs were most vulnerable to the oil price increases and recessions. These countries were more dependent on imported oil. The South Asian countries were less effected by the external shocks due to low per capita consumption of imported oil, except for Pakistan and Sri Lanka who were more dependent on imported oil. Oil price increases had more severe immediate effects than world recessions on the balance of payments. Policy responses to external shocks include (i) increase in country's share in world markets by diversifying its exports and trading partners, (ii) import substitution, (iii) reducing imports through lower GNP growth and (iv) increasing net external financing.

Review of Macroeconometric Models

Single Equation Models

Goldsbrough and Zaidi (1986) examine the principal channels through which macroeconomic developments in industrial countries influence the economic growth and balance of payments of developing countries. These links are analyzed using single equation (reduced-form) estimates. They study broad trends in output growth rates in industrial and developing countries. The rate of growth of industrial countries is not the only factor affecting the growth rates of developing countries. Major determinants of economic performance of developing countries include the underlying structural characteristic and efficacy of domestic policies. Ordinary least square regressions of growth in terms of trade and volumes of trade on growth in industrial countries were used. Results show that the commodity composition of developing countries' exports are a key determinant of the impact of industrial country growth on their export volumes and prices. Within the group of non-oil exporters, the terms of trade of the primary product exporters are more sensitive to changes in industrial country economic activity than those of the exporters of manufactures. The geographic destination of developing countries' exports is an important factor in the transmission of economic influences. Protectionism in industrial countries can have a considerable effect on the price and volume of developing countries' exports by lowering the effective demand for these exports. Developing countries' earnings from services and private transfers (mainly migrants' remittances) are a important source of foreign exchange earnings. Changes in the developing countries' export earnings can affect their output growth.

Dornbusch (1986) analyzed the effects of OECD macroeconomic policies on non-oil developing countries by examining the well-known theoretical channels of interdependence and some of the available empirical evidence.

He regressed developed country growth on the growth of non-oil developing countries. Three alternative measures of growth in developed countries were used: growth in GDP; industrial production; and imports. Estimated coefficients on all these measures were significant.

Dornbusch focused on various external aggregates of developing countries: commodity prices, the terms of trade, export volume and interest rate by estimating separate equations, in order to discuss the implications of alternative macroeconomic scenarios on the linkages between develop and developing countries. In particular, he regressed growth in export volume on GDP growth in industrial countries and change in relative price (or competitiveness) of non-oil developing countries' exports. His evidence indicated that growth in developed countries favorably affects the exports earnings of developing countries. Separate regressions for countries in Western Hemisphere and Asia show that elasticity of export volume with respect to industrial country growth is higher in the case of Asia but is lower than the one for all non-oil developing countries.

Multi Equation Models

Mercenter and Waelbroeck (1984) illustrated North-South interdependence by means of a general equilibrium model. They discuss alternative ways of accounting for developing countries' sensitivity to outside shocks, and the advantages and shortcomings of general equilibrium and Keynesian macro models. The major traits of the model used for simulations are examined and their properties are discussed from a theoretical point of view in terms of a simplified version of the Keynesian system. They present the model's elasticity multipliers computed from runs based on assumptions made in the 1983 World Development Report. Shocks which the developing countries face include lower OECD growth, oil price increases, interruption of private capital flows. They find that reducing developed countries' protection is more beneficial than extending aid in terms of raising GDP in less developed countries. The middle income developing countries are more sensitive to OECD growth than those that are low income. This reflects the large size of the traditional rural sector in the latter, and the lack of openness to foreign trade of the South Asian subcontinent. The sensitivity of oil exporters is very low. Giving aid is good for the donors. Recipients gain both from the capital inflow and from the more outward oriented policies that aid permits. The middle income countries are more sensitive to oil prices than the low income, whose agricultural sectors use little imported energy. Oil importing countries are hit both by the direct impact of expensive oil on their balance of payments situation, and by the recession caused in developed countries by the oil price increase. Protection by the less developed of their economies does not insulate a country from unfavorable balance of payments shocks; it makes the situation worse. Developing countries are hit by the direct impact of the protection on their exports and by the market loss resulting from the lower GDP.

Hicks (1984) describes the structure, assumptions and projection results of the SIMLINK (SIMulated trade LINKages) model. The purpose of this model is to simulate the trade linkages between the developed and developing world. The model estimates the price and volume of a series of commodities important to LDC exports. The export earnings for seven LDC regions are estimated from the commodity projections, and combined with a predetermined estimate of capital inflows to calculate import capacity. A simple growth model for each region then determines the import constrained growth rate for that region.

Sanderson and Williamson (1985) review the quantitative relationships between external shocks, economic policies and performance across a sample of developing countries. They review cross-country comparative studies of the shock-policy adjustment relationship and eight World Bank macroeconomic models of individual economies. Most of these models are computable general equilibrium (CGE) models (Thailand, Indonesia, Turkey, Yugoslavia, Chile and Ivory Coast) and two Keynesian (Nigeria and Korea). These models are designed to show how these eight countries adjust to external shocks and which policies would have been most effective. The models suggest that overvalued currencies have indeed played an important role in economic adjustment. CGE models give considerable insights into the distributional aspects of adjustment policies.

Beenstock (1988) develops econometric models that capture North-South interdependence. In the model for industrial countries main endogenous variables are GDP, inflation, interest rate and primary product prices. The endogenous variables for non-oil developing countries include exports, imports, capital flows, reserves and the exchange rate. The determinants of inflation and growth are presumed exogenous. This paper highlights the comparative static implications as regards the interdependence issue. This essentially amounts to exogenizing Northern variables in the Southern model (and vice versa) and shocking them. A capital transfer from the North to the South raises the Southern real exchange rate thereby damaging exports and raising imports. Expansions of Northern economic activity raises Southern exports which in time raises their imports and the real exchange rate; hence the Southern current account improvement is temporary. This results in increase in non-oil commodity price which magnify the process, but higher interest rate raise debt service costs. When the oil price rises, the harm to the South is partly counterbalanced by increases in the relative price of non-oil commodities.

Masson, Symansky and Meredith (1990) report on the latest version of the IMF's MULTIMOD model. It was designed to analyze the effects of industrial countries policies on major macroeconomic variables, both in the developed and developing countries. To a limited extent, it can also be used to evaluate the economic policies of developing countries. The latest version of the model disaggregates the industrial bloc into its component countries. The rest of the world is divided into high-income oil exporters and capital importing developing countries. The capital importing developing countries make up one aggregate region with industrial production disaggregated into manufactures, oil, and primary commodities. High-income oil exporters are treated separately in a simplified form. Some standard simulations, like increase in U.S. fiscal expenditures and unexpected U.S. monetary expansion, are presented in the end.

Schadler (1986) examines the linkage between developments in industrial countries and the economic performance of a group of six Asian countries. A model is developed to investigate these links, taking into account developments in both the Asian countries' external position and their domestic economies.

Several factors affect the sensitivity of Asian countries to slower growth in industrial countries. For Asian countries as a group, external financing is not a binding constraint and these countries are able to finance a larger current account deficit. GNP growth is largely demand-determined in this model, as experience with Asian countries has shown. Thus, this model cannot be use for long-run analysis.

The model contains behavioral equations to determine the current account and growth in GNP. Equations for demand and supply of manufactures and non-fuel primary export, imports and net service account determine the current account. GNP is the sum of net exports, domestic demand (private and public consumption and investment) and net factor income. Domestic demand is assumed to grow at a rate proportional to real income growth, determined by macroeconomic policies.

The model is simulated under various assumptions about both economic performance in industrial countries and policy reactions in the Asian countries. Specifically, the outcomes for the current account position, debt-servicing burden, and GNP growth of the six Asian countries under a low-growth and a high-growth scenario are compared. A slowdown in growth in industrial countries affects the Asian countries directly through lower growth in export receipts. This results in lowering the growth of real income, and consequently reduction in the growth of absorption and the growth of import volume. Reduction in import growth is not sufficient to prevent a significant deterioration in current account which raises indebtedness.

Description of the Model

The main purpose of the model will be to study the mechanism by which external shocks are transmitted to an ADC and the policy adjustments these countries undertook during the last two decades. The main structure of the model is taken from Schadler (1986).

External shocks are transmitted to a country directly through the trade sector and thus, first, we concentrate on the trade sector.

Trade Sector

Using the national income accounting framework, a macroeconometric model is formulated as shown in Figure 3. The balance of payments is divided into a capital and current account, which is further divided into exports, imports and net transfers and services.

Exports of the ADCs consist predominantly of primary products in Group III and manufactured products in Group I. For this reason, exports are divided into primary and manufactures products. Furthermore, primary product exports are divided into fuel and non-fuel. Schadler (1986) used demand and supply equations for exports to study the effects of external shocks. Export equations will contain variables from the demand and supply side.

Changes in the price of fuel and the recession in industrial countries requires countries to adjust their fuel, manufactures and nonfuel primary imports. Therefore, imports are divided into fuel, manufactures and nonfuel primary goods.

External shocks affect the trade sector directly and subsequently spread to other part of the domestic economy. The link between the trade and domestic sector in this model is through trade and domestic prices.

The basic macroeconometric model is shown in Table IX. Dornbusch (1985) investigates the impact of economic conditions in industrial countries on less developed countries, in order to understand their divergent economic performance. The superior performance of Asian

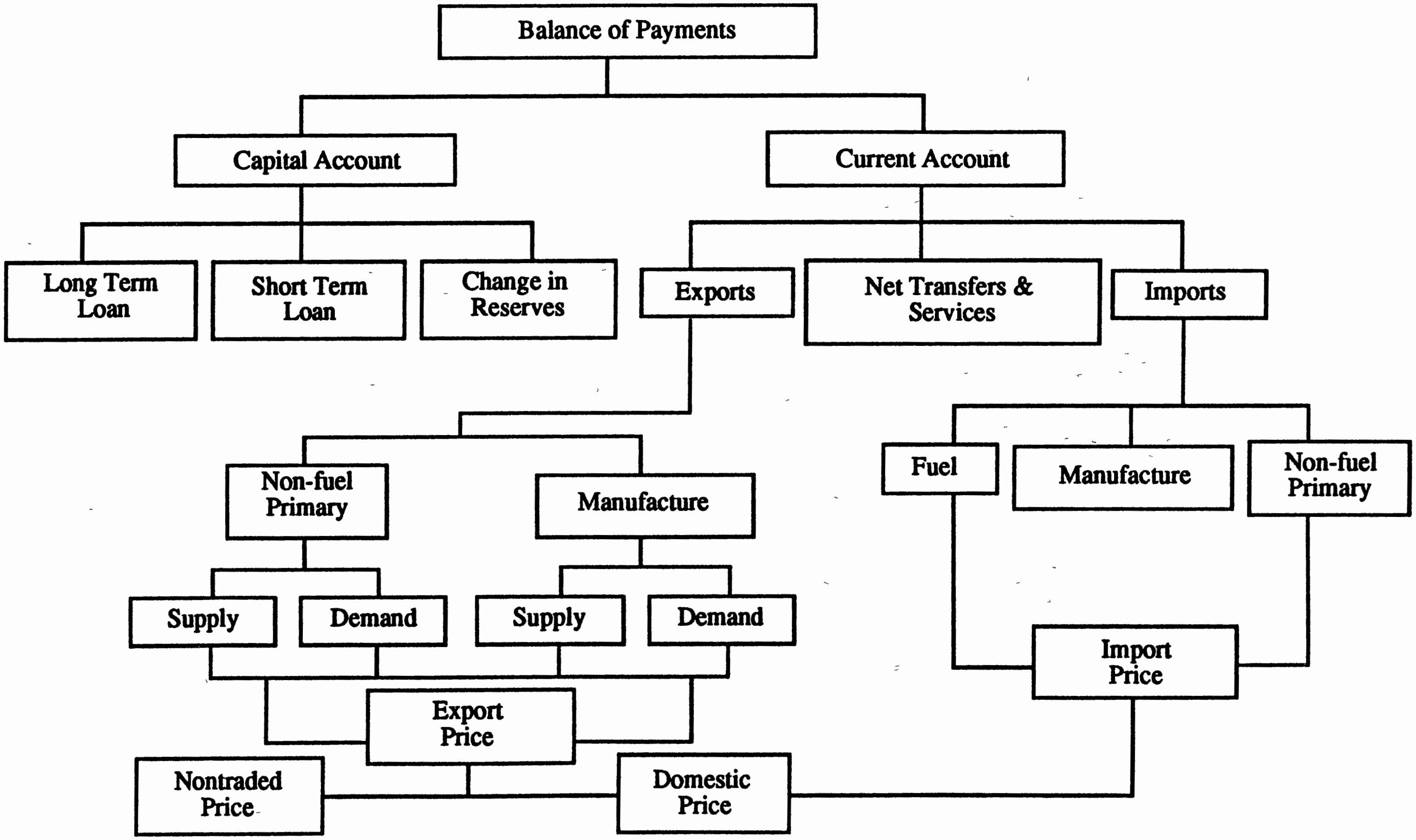

Figure 3. A Schematic Presentation of the Macroeconometric Model

TABLE IX

MACROECONOMETRIC MODEL

MANUFACTURES EXPORTS

(1) $x_m^s = a_0 + a_1(px_m + e_D - p_D) + a_2(m_f - vtm) + \epsilon_1$

(2) $x_m^d = b_0 - b_1(px_m - px_m^*) + b_2(act^*) + \epsilon_2$

(1a) $px_m = a_0' + a_1'(x_m) + a_2'(p_D - e_D) - a_3'(m_f - vtm) + \epsilon_1'$

(2a) $x_m = b_0' - b_1'(px_m - px_m^*) + b_2'(act^*) + \epsilon_2'$

NONFUEL PRIMARY EXPORTS

(3) $x_{nfp}^s = c_0 + c_1(px_{nfp} + e_D - p_D) + c_2(m_f - vtm) + \epsilon_3$

(4) $x_{nfp}^d = d_0 - d_1(px_{nfp} - px_{nfp}^*) + d_2(act^*) + \epsilon_4$

(3a) $px_{nfp} = c_0' + c_1'(x_{nfp}) + c_2'(p_D - e_D) - c_3'(m_f - vtm) + \epsilon_3'$

(4a) $x_{nfp} = d_0' - d_1'(px_{nfp} - px_{nfp}^*) + d_2'(act^*) + \epsilon_4'$

VOLUME OF EXPORTS

(5) $VTX = X_m + X_{nfp} + X_f$

PRICE OF EXPORTS

(6) $txpr = e_1(px_m) + e_2(px_{nfp}) + \epsilon_5$

MANUFACTURES IMPORTS

(7) $m_m = f_0 - f_1(pm_m^* + e_D - p_D) + f_2(r - tmpr) + \epsilon_6$

TABLE IX (Continued)

FUEL IMPORTS

(8) $m_f = g_0 - g_1(pm_f^* + e_D - p_D) + g_2(r - tmpr) + \epsilon_7$

NONFUEL IMPORTS

(9) $m_{nfp} = h_0 - h_1(pm_{nfp}^* + e_D - p_D) + h_2(gnp) + \epsilon_8$

VOLUME OF IMPORTS

(10) $VTM = M_m + M_f + M_{nfp}$

UNIT PRICE OF IMPORTS

(11) $tmpr = i_1(pm_m^*) + i_2(pm_f^*) + i_3(pm_{nfp}^*) + \epsilon_9$

NET SERVICES

(12) $NS = (XNFS + XFS) - (MNFS + ((i_2 * EXTDEBT) + (MFS - (i_2 * EXTDEBT))))$

NET TRANSFERS

(13) $NTR = TRFPRVT + TRFOFFN$

CURRENT ACCOUNT

(14) $CA = (VTX * TXPR) - (VTM * TMPR) + (XMRCH - (VTX * TXPR)) + (MMRCH - (VTM * TMPR)) + NS + NTR$

CAPITAL ACCOUNT

(15) $KA = CAPINF + RESERVES$

BALANCE OF PAYMENTS

(16) $BOP = CA + KA + EOBP$

TABLE IX (Continued)

DOMESTIC PRICE

(17) $p_D = j_1(abs) + j_2(tmpr) + \epsilon_{10}$

PRIVATE CONSUMPTION

(18) $c = k_0 + k_1(m_m) + \epsilon_{11}$

GROSS DOMESTIC INVESTMENT

(19) $gdominv = l_0 + l_1(indust) + l_2(capinf - gdpdef) + \epsilon_{12}$

ABSORBTION

(20) $ABS = C + GDOMINV + G$

GROSS NATIONAL PRODUCT

(21) $$GNP = \left(\frac{ABS + (VTX + RXGNFS) - (VTM + RMGNFS) + XFS - MFS}{GDPDEF}\right) + EONA$$

INDUSTRIALIZATION

(22) $indust = m_0 + m_1(m_f) + \epsilon_{13}$

Note: Symbols are defined in Appendix A. Lowercase letter denote logarithms of variables. Superscript s denote supply and supercript d denote demand.

countries could be due to their trade structure or initial conditions, domestic policies and their differential ability to adjust to external shocks. He lists three principal channels through which foreign influences affect a developing economy: the real price of primary commodities, the world rate of interest on the LDCs debt and the level of world demand. Countries with a higher percentage of manufactured exports will be less susceptible to fluctuations in primary commodity prices. The model here will incorporate these factors.

Khan and Goldstein (1978) outline a model of demand and supply of exports using quarterly data on aggregate exports of eight industrial countries for the period 1955-1970. They used a model of export quantity and price determination, which assumes that adjustment of export quantity and price to their respective equilibrium values is instantaneous. This model is adopted here to determine the volume and price of manufactures and non-fuel primary exports.

Equation (1) shows the export supply equation for manufactures. Supply of exports is specified as a log-linear function of the price of exports relative to domestic price (PX_mE_D/P_D).[5] As the price of exports rises relative to domestic price, production of manufactures exports become more profitable and therefore the volume of exports increases (Khan and Goldstein, 1978). The volume of fuel imports relative to total volume (M_f/TM) is assumed to exert a positive impact on the supply of exports. This variable is added to capture the dependence of the export sector on fuel imports. Thus, if fuel imports are reduced as a result of any fuel price increase, exports would fall.

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[5] E_D is the domestic currency value of foreign exchange. In what follows, the logarithms of a variable will be denoted by the corresponding lower case letters.

Equation (2) shows the demand for exports of manufactures. It is assumed to depend on the export price of manufactures relative to the price of foreign competitors (PX_m/PX_m^*). About 50 percent of the trade of ADCs is with the major industrial countries (DeRosa 1986, p. 32). According to Langhammer (1986), during 1970-84, the EEC and Japan became less important as export markets for the ADCs, while exports to the United States and the Middle East increased. Demand for manufactured exports is assumed to be affected by the economic activity in the industrial countries (ACT^*). (Hicks, 1984, pp. 97-98 and Brissimis and Leventakis, 1989, p. 249). Middle-income developing countries are much more sensitive to OECD growth than low income countries (Mercenier and Waelbroeck, 1984, p. 228). ACT^* is entered in the export demand equation across different groups of ADCs to take account of this. An economic boom in the industrial world can boost the demand for exports. Following Khan and Goldstein (1978), the supply equation is normalized for the price of exports as shown in (1a). Assuming $x^d = x^s = x$ and the addition of stochastic error terms, equations (1a) and (2a) constitute the equilibrium model for manufactures.

Equation (3) shows the supply of non-fuel primary exports. This equation is specified as same way as the one for manufactures exports. Demand for non-fuel primary exports (4) depends on economic activity in industrial countries (ACT^*) as in (2). Equations (3a) and (4a) constitute the equilibrium model for non-fuel primary products. Volume of fuel exports X_f is treated as exogenous, as most countries in the sample are net oil importers. Only Malaysia and Indonesia are the net oil exporters during the estimation period. As will be explained below, a structural equation of volume of fuel exports for only Malaysia and Indonesia was tried in the context of present model. Poor estimation and simulation results were the reason for keeping it exogenous in the present model.

Faini, Pritchett and Clavijo (1988) summarize import behavior in developing countries. They estimated a traditional import demand function relating real imports to price of imports relative to domestic price and domestic output for fifty developing countries. This relation is shown by equation (7) which shows manufactures imports into a country. Quantity of manufactures imports would fall as foreign price of manufactures goods relative to domestic price ($PM^{*}_{m}E_{D}/P_{D}$) increases. Real foreign exchange reserves (R/TMPR) is added to the equation because it is hypothesized that imports are curtailed when reserves of foreign exchange are in short supply (Beenstock, 1988, p. 46).

Fuel imports are given by equation (8). They depend on relative import prices ($PM^{*}_{f}E_{D}/P_{D}$) and real foreign exchange reserves (R/TMPR). Nonfuel primary imports are given by Equation (9). They depend on relative import prices ($PM^{*}_{nfp}E_{D}/P_{D}$) and gross national product (GNP). The ability to raise export growth depends mainly on external factors such as world economic conditions and protection in external markets. However, when a country faces a series of internal and external shocks, imports are the main instruments of adjustments. GNP was used as a explanatory variables for all import equations. However, the solution during the simulation analysis process fails to converge. For this reason GNP is assumed to explain only the volume of nonfuel primary imports. Thus, only nonfuel imports are adjusted relative to GNP. Other imports categories change independent of changes in GNP.

Equations (5) and (10) give the volume, and equations (6) and (11) give the price of exports and imports respectively. Equation (12) defines net services as the difference between services receipts and services payments. Services receipts are the sum of non-factor service receipts (XNFS) and factor services receipts (XFS). Services payments are the sum of non-factor services payments (MNFS) and factor services payments (MFS). For the purpose of future simulation analysis of the affects of higher interest rate on ADCs during the period of economic turmoil, longterm interest payments on outstanding debt needs to be separated out from the rest of net service account. For this reason, longterm interest payment [(i_2*EXTDEBT), where i_2 is the interest rate charged on external debt (EXTDEBT)], is added and subtracted from services payments (MNFS+MFS). Net transfers is shown by equation (13). It is the sum of net private current transfers (TRFPRVT) and net official transfers (TRFOFFN). Equation (14) defines the current account as net exports plus net services (NS) and transfers (NTR) (Schadler 1986, p. 354). Net exports in current account refers to the difference between the merchandise exports (XMERCH) and merchandise imports (MMERCH). In order to connect it to the rest of the model, the value of exports (VTX*TXPR) and the value of imports (VTM*TMPR) are added and subtracted from the XMERCH and MMERCH. Equation (15) shows the capital account (KA) as the sum of capital inflow (longterm and shorterm) and changes in reserves (RESERVES). Finally, the balance of payment (BOP) identity is given by equation (16), which is the sum of current account (CA), capital account (KA) and errors and omissions in balance of payments (EOBP) (Elliot, Kwack and Tavlas, 1986).

Domestic Sector

This study will contain only the most salient aspects of the domestic sector. The prices for traded and nontraded good provide a link between the trade and domestic sector. Equation (17) shows the domestic price (P_D) as a function of absorption (ABS) and import prices (TMPR), defined in equation (11). If import price changes for any reason, domestic price (P_D) should also change, as import prices are one component of domestic price level. Therefore, equation (17) shows the domestic price (P_D) as the function of import prices (TMPR). Also, if real absorption declines as a result of an external shock, demand for nontradable or domestic goods will decline. As a result, the domestic price would also decline. For this reason real absorption (ABS) is added to equation (17).

Fry (1986) estimated a three equation model of investment, saving and growth with pooled data for 14 Asian developing countries over the 1961-83 period, in order to explore terms of trade dynamic effects on the current account. Private consumption (C) [equation (18)] depends on the volume of manufactured imports (M_m), including consumer goods. Any adjustment to external shocks, which reduces manufactured imports, would also reduce private consumption. Traditionally, real output explains real consumption, but in this model, the effect of changes in imports on output was more important. Gross domestic investment (GDOMINV) equation (19) depends on the pace of industrialization (INDUST) and real longterm capital inflow (CAPINF/GDPDEF). Rapid industrialization requires more capital accumulation, and, thus, INDUST is included in equation (19). One can argue reasonably that the causation is the other way round, that is from investment to industrialization. Another argument is that the relation between investment and industrialization is simultaneous. Increasing level of domestic investment contribute to the pace of industrialization. However, to maintain this faster pace of industrialization, higher level of investment is needed. The main objective of the model is to capture the adjustment efforts of ADCs due to external shock like increase in imported fuel price. Any increase in imported fuel price should depress real absorption, including gross domestic investment (GDOMINV). This affect is captured by considering only one side of the simultaneous link between GDOMINV and INDUST. A specification of the model where GDOMINV and INDUST are simultaneous results in unstable solution during simulation analysis. To investigate whether an increasing flow of external finance contributes to capital accumulation, real capital inflows (CAPINF) is included in equation (19). Domestic absorption (ABS) is the sum of private consumption (C), gross domestic investment (GDOMINV) and government expenditures (G), as shown in equation (20). Equation (21) defines gross national product (GNP) as the sum of absorption, the net exports in national accounts, real net factor income and error and omissions (EONA) in national accounts. Net exports in national accounts is the difference between the exports and imports in national accounts. Exports in national accounts is defined as the sum of volume of exports (VTX) and exports of goods and nonfactor services, excluding the VTX (RXGNFS). Similarly, imports in national accounts is defined as the sum of volume of imports (VTM) and the rest of imports of goods and nonfactor services (RMGNFS). Real net factor income is the difference between factor services receipts (XFS) and factor services payments (MFS), converted to real terms by gross domestic product deflator (GDPDEF). Finally the pace of industrialization (INDUST) is explained in equation (22) by volume of fuel imports (M_f). Rapid industrialization requires increasing flow of fuel imports. Thus, M_f is assumed to have a positive effect on the pace of industrialization.

Exchange Rate

In most developing countries, the domestic currency tends to be pegged, either to an individual currency or a basket of currencies and countries are reluctant to devalue their currencies. Devaluation is usually a last resort, frequently as a result of pressure from major creditors and the International Monetary Fund (IMF). Political pressures and lobbying play a key role in determining the level the exchange rate is fixed. In the macroeconometric model, the exchange rate is exogenous. It is introduced in the model when converting domestic price P_D in terms of foreign exchange. Thus, if the exchange rate (E_D) is increased (the domestic currency is devalued), exports will expand through equations (1a) and (2a). Imports will decrease as in Equations (7), (8) and (9).

In view of the substantial fluctuations in exchange rates among major currencies, the recent increase in protectionist pressures and the disappointing performance of world trade, renewed concern has been expressed about the possible adverse effects of exchange rate variability on trade. Increased exchange rate risk increases uncertainty faced by foreign buyers, reducing quantity demanded and thus international trade. The empirical literature investigating the relationship between exchange rate risk and trade volume is inconclusive as to whether exchange rate uncertainty affects the level or pattern of trade. This could be due to using a reduced form trade volume equation which assumes a constant relation between exchange rates and prices (Mann 1989, p. 589). In order to capture the uncertainty effect, exchange rate variability (VREER5) is added to export volume equations (2a) and (4a). Following Kenen and Rodrik (1986), VREER5 is the standard deviation of the quarterly percentage change in real effective exchange rate (REER), where REER is a quarterly effective exchange rate based on bilateral exchange rates between a country and its industrial-country trading partners. All variables are defined more precisely in Appendix A.

CHAPTER III

EMPIRICAL RESULTS

Estimation Procedure

One way to study the effects of external shocks is to estimate a separate model for each of the ADCs. However, we are more interested in studying groups of ADCs. Therefore, separate estimates for each of the country groups will be obtained. Individual countries within a group are pooled over time.

Dielman (1983) gave a brief survey of the current statistical methodology of pooling cross section and time series data. Classical pooling assumes that coefficients across individual cross sectional units are equal. However, it ignores the differences between cross section units. One remedy is to introduce dummy variables to allow the equation intercept and slope to vary, to represent individual or time effect. In the present study, we will introduce intercept dummy variables for all sample countries. The model estimates separate slope coefficients for each one of the groups in order to gauge their differential performance.

System of Simultaneous Equations

The macroeconometric model contains twenty-two equations, thirteen of which are stochastic or behavioral equations and nine are identities.

These equations constitute a system of simultaneous equations, which can be estimated and solved by several different methods.

The standard linear simultaneous-equations model can be written in structural form [see, for example, Intriligator (1978)] as g simultaneous equations

$$\underset{n \times g}{Y} \; \underset{g \times g}{\Gamma} + \underset{n \times k}{X} \; \underset{k \times g}{B} = \underset{n \times g}{E} \tag{3.1}$$

where Y is the matrix of g endogenous variables (determined within the model), X is the matrix of k predetermined variables (determined outside the model), and E is the matrix of g stochastic disturbance terms. Γ and B are coefficient matrices of endogenous and predetermined variables. n is the sample size (the number of observations).

Assuming Γ is a nonsingular matrix, it is possible to solve for the matrix of endogenous variables Y by postmultiplying (3.1) by Γ^{-1}, which gives

$$Y = - X B \Gamma^{-1} + E \Gamma^{-1} \tag{3.2}$$

or

$$\underset{n \times g}{Y} = \underset{n \times k}{X} \; \underset{k \times g}{\Pi} + \underset{n \times g}{U} \tag{3.3}$$

where

$$\underset{k \times g}{\Pi} = - \underset{k \times g}{B} \; \underset{g \times g}{\Gamma^{-1}} \tag{3.4}$$

and

$$\underset{n \times g}{U} = \underset{n \times g}{E} \underset{g \times g}{\Gamma^{-1}} \tag{3.5}$$

Equation (3.3) is the reduced form, which expresses each of the endogenous variables in Y as a linear function of all predetermined variables in X and the stochastic disturbance terms in U (Intriligator 1978, p. 380).

Consider the first structural equation of the system (3.1). The matrix of endogenous variables Y can be partitioned into

$$\underset{n \times g}{Y} = (\underset{n \times 1}{y_1} \quad \underset{n \times (g_1 - 1)}{Y_1} \quad \underset{n \times (g - g_1)}{Y_2})$$

where y_1 is the column vector of dependent endogenous variable, Y_1 is the matrix of g_1 - 1 other included explanatory endogenous variables, and Y_2 is the matrix of g - g_1 excluded endogenous variables. Similarly, the matrix of predetermined variables X can be partitioned into

$$\underset{n \times k}{X} = (\underset{n \times k_1}{X_1} \quad \underset{n \times (k - k_1)}{X_2})$$

where X_1 is the matrix of k_1 included predetermined variables and X_2 is the matrix of k - k_1 excluded predetermined variables. There is a trivial indeterminacy in each of the structural equations of (3.1) in that multiplying all terms by any nonzero constant does not change the meaning of the equation. This indeterminacy is eliminated by normalization which sets all diagonal elements of Γ equal to -1. This normalization is equivalent to writing one endogenous variable on the left-hand side of the equation, with a coefficient of one (Intriligator 1978, p. 43). Solving (3.1) for y_1 then yields

$$\underset{n \times 1}{y_1} = \underset{n \times (g_1 - 1)}{Y_1} \; \underset{(g_1 - 1) \times 1}{\gamma_1} + \underset{n \times k_1}{X_1} \; \underset{k_1 \times 1}{\beta_1} + \underset{n \times 1}{\epsilon_1}$$

where ϵ_1 is the negative of the vector of n stochastic disturbance terms for the first equation, γ_1 are the g_1 - 1 coefficients of explanatory endogenous and β_1 are the k_1 coefficients of exogenous variables included in the first equation.

<u>Identification</u>

The problem of identification is that of obtaining estimates of the coefficient matrices Γ and B of the structural form (3.1), given the estimates of the coefficient matrix Π of the reduced form (3.3). A system of structural equations, summarized by the structural form (3.1), is identified if every equation in the system is identified.

Following Intriligator (1978) and Greene (1990), identification rules for the system of simultaneous system are discussed. Consider the first structural equation of the system (3.1). Given,

g_1 = number of endogenous variables included in the equation

$k - k_1$ = number of predetermined variables excluded from the equation

A_1 = matrix of coefficient for endogenous variables excluded from the equation

A_2 = matrix of coefficient for predetermined variables excluded from the equation

$A = (A_1 , A_2)$

An equation in a structural form of a simultaneous system is identified if:

1. $k - k_1 \geq g_1 - 1$ that is, the number of excluded predetermined variables must be at least as great as the number of included endogenous variables, less one. This is the necessary condition, commonly known as order condition of identification.
2. $\text{Rank}[A] = g - 1$ that is, the matrix of coefficient in other equations, excluded from the first equation have rank equal to the number of endogenous variables, less one. This is the sufficient condition, commonly known as rank condition of identification.

In the present model, there are twenty two endogenous variables (g) and twenty seven predetermined variables (k). Given this, all the equations in the macroeconometric model satisfy the necessary condition of identification, namely the order condition. The model pools cross sectional and time series data, and thus one hundred and eighty seven parameters are estimated. Further complications arise due to the nonlinear nature of some of the variables, because these variables were defined both in level and log terms. Thus, the rank condition of identification was not tested.

Estimation Methods

Consider the first structural equation of the system, to be estimated

$$y_1 = Y_1 \gamma_1 + X_1 \beta_1 + \epsilon_1 = Z_1 \delta_1 + \epsilon_1 \qquad (3.6)$$

where,

$$\underset{n \times (g_1-1+k_1)}{Z_1} = (\underset{n \times (g_1-1)}{Y_1} \quad \underset{n \times k_1}{X_1}) \qquad (3.7)$$

g_1 = endogenous variables included in first equation

k_1 = predetermined variables included in first equation

Z_1 lumps together data on all $(g_1 - 1 + k_1)$ included explanatory variables whether endogenous or predetermined. δ_1 is a vector summarizing $(g_1\text{-}1\text{+}k_1)$ coefficients to be estimated in the first equation.

Let $Z = \text{diag}(Z_1, \ldots Z_g)$, $\delta' = [\delta_1, \ldots \delta_g]$, $y' = [y_1, \ldots y_g]$, $\epsilon = [\epsilon_1, \ldots \epsilon_g]$ then

$$\underset{gn \times 1}{y} = \underset{gn \times k^*}{Z} \; \underset{k^* \times 1}{\delta} + \underset{gn \times 1}{\epsilon} \qquad (3.6)$$

where k^* is the total number of coefficients to be estimated.

A system of simultaneous equations can be estimated by ordinary least squares (OLS). Least squares is applied to each equation of the system separately. This approach ignores the distinction between explanatory endogenous and included predetermined. It also ignores all information available concerning variables in the rest of the model. Therefore, OLS leads to biased and inconsistent estimators (Intriligator 1978, p. 375).

Applying OLS to (3.6) gives

$$\hat{\delta}_{OLS} = (Z'Z)^{-1} Z'y \qquad (3.7)$$

The problem in applying OLS directly to (3.6) is the presence of explanatory endogenous variables, y, and the correlation with the stochastic disturbance term, ϵ. If these could be replaced by related variables that are uncorrelated with the stochastic disturbance term, (known as instrumental variables), the resulting estimators would be consistent. In two stage least squares (2SLS), explanatory variables are replaced by their estimated values.

$$\hat{\delta}_{2SLS} = (\hat{Z}' \hat{Z})^{-1} \hat{Z}' y \qquad (3.8)$$

Where,

$$\hat{Z} = \chi (\chi' \chi)^{-1} \chi' Z$$

and,

$$\underset{gn \times gk}{\chi} = \text{diag } (X, \ldots X) = \underset{g \times g}{I} \otimes \underset{n \times k}{X}$$

Using the properties of Kronecker product ($\otimes$), the 2SLS estimator can be written as

$$\hat{\delta}_{2SLS} = \{Z' [I \otimes X(X'X)^{-1}X']Z\}^{-1} Z'[I \otimes X(X'X)^{-1}X']y \qquad (3.9)$$

The problem with 2SLS, as with OLS, is the correlation between the explanatory variables and stochastic terms. The OLS estimator in (3.7) takes no account of the distinction between explanatory endogenous and included predetermined variables and is biased and inconsistent. The

2SLS in (3.9) takes into account this distinction in each equation, but ignores the possible correlation between explanatory variables in one equation and the stochastic disturbance terms in all other equations. Three stage least squares (3SLS) improve upon the asymptotic efficiency of 2SLS by taking explicit account of this interequation correlation.

The 2SLS estimator can be interpreted as using all predetermined variables as instrumental variables and estimating the resulting equation using generalized least squares (GLS). The 3SLS follows the same approach for the entire system of equations. Premultiply (3.6) by χ', which gives

$$\chi' y = \chi' Z \delta + \chi' \epsilon \tag{3.10}$$

The GLS estimator of this equation is the 3SLS estimator

$$\hat{\delta}_{3SLS} = \{Z'\chi[Cov(\chi'\epsilon)]^{-1} \chi' Z\}^{-1} \cdot Z'\chi[Cov(\chi'\epsilon)]^{-1}\chi' y \tag{3.11}$$

Given, $Cov(\chi'\epsilon) = \chi'(\Sigma \otimes I)\chi$ (3.12)

and $\Sigma = [\sigma_{ij}] = Cov(\epsilon)$

$$\hat{\delta}_{3SLS} = \{Z'\chi[\chi'(\Sigma \otimes I)\chi]^{-1}\chi' Z\}^{-1} \cdot Z'\chi[\chi'(\Sigma \otimes I)\chi]^{-1}\chi' y \tag{3.13}$$

The 3SLS estimator is both consistent and asymptotically more efficient than the 2SLS estimators, since it takes explicit account of the covariance in Σ. If all equations are just identified or the covariance matrix Σ was diagonal, then the 3SLS estimator would reduce to the 2SLS estimator (Intriligator 1978, p. 408). Σ is generally not known, but it can be estimated using the 2SLS residuals.

The three stages of 3SLS can be summarized as follows:

1. Estimate the reduce form, as in (3.3).
2. Estimate each structural equations via 2SLS, as in (3.9).
3. Estimate the system using GLS, after having used all predetermined variables as instrumental variables, as in (3.13), where the covariance matrix is estimated from the residuals of the 2SLS estimates.

Regression Results

The macroeconometric model discussed in the previous chapter is estimated for the period 1968-89[6] for a sample of ten ADCs using nonlinear three-stage least squares. The estimation method is PROC MODEL from SAS/ETS which combines iterative minimization methods for nonlinear regression to estimate parameters in a simultaneous system of nonlinear equations (SAS 1988, p. 318). The PROC MODEL's aims is to minimize a generalized mean square known as the objective function (SAS 1988, p. 342). This study uses the Gauss-Newton method for minimizing the objective function.

As was mentioned earlier, countries were divided into three groups. Individual countries within a group are pooled over time. In order to test whether pooling countries into three groups or a single coefficient for all countries is appropriate, a test suggested by Gallant and Jorgenson (1979) is used. They showed how the change in the least

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[6] Due to data unavailability some of the years had to be excluded for several countries.

squares criterion function can be used to arrive at an asymptomatically valid Chi-Square test. In order to compare the parameters across several equations, the covariance of equation errors must be restricted to be same. In summary, SAS (1988) defines the method is as follows:

1. Estimate the model (unconstrained) with intercept dummies for all countries, and slope dummies for each one of the groups, and obtain the covariance matrix.
2. Use this covariance matrix to estimate a model (constrained) where slope coefficients are the same across all countries.
3. Compare (Oc - Ou) to a chi-square table, where Oc is the constrained criterion function (OBJECTIVE*N) and Ou is the unconstrained OBJECTIVE*N, where N is the number of observations. The degrees of freedom equal the difference in the number of free parameters in the two models (number of restrictions).

Estimation of the macroeconometric model gives

OBJECTIVE*N of unconstrained model (Ou) = 1341

OBJECTIVE*N of constrained model (Oc) = 1869

Oc - Ou = 1869 - 1341 = 528

Number of restrictions = 187 - 129 = 58

From chi-square table $\chi^2_{60,0.05} = 79.08$

Since the Oc - Ou is greater than the critical value, therefore, we can reject the hypothesis that slope coefficients are equal across countries. Thus, countries are divided in groups.

Data Sources and Transformations

A list of the variables and data sources is given in Appendix A. The main source of data is the World Tables of the World Bank (source a).

The unit of each variable used in the study is changed to millions of domestic currency and then converted to U.S. dollars for a standard comparison across diverse sample countries. Whenever necessary, nominal variables are expressed in real terms using the appropriate deflator. The base year for each index is 1980. One of the important variables in this study is the level of foreign activity (ACT^*). It is calculated as the weighted average of the real GNP of each country's major industrial country trading partners. Weights used are the export shares in a given year. ACT^* was then converted to an index, using 1980 as the base year. Using a similar approach, foreign export prices $PX_m{}^*$ and $PX_{nfp}{}^*$ were computed. These are the trade weighted average of manufactures and nonfuel primary export unit value index of the major industrial-country trading partners.

The estimation results are presented in Table X. The estimated equation for manufactures exports volume shows a negative (and significant) coefficient for the domestic price of exports relative to foreign competitors price ($PX_m/PX_m{}^*$), for Group II and Group III countries. Similarly, ($PX_{nfp}/PX_{nfp}{}^*$) has the expected sign for Group II and Group III countries, although it is not significant for Group III. However, for Group I countries the sign is contrary to expectations but insignificant in the case of both manufactures and non-fuel exports. Thus, relative prices are not a significant determinant of export volume for Group I and non-price factor play a major roles for these countries. The estimated coefficients for foreign economic activity (ACT^*) are of the expected sign and significant in the export volume equations for both manufactures and non-fuel primary goods, except for Group III in the case of non-fuel primary exports. A positive sign indicates that in

TABLE X

REGRESSION RESULTS

	Group I		Group II		Group III	
	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
Manufactures Exports Volume						Adj R^2=0.93
$px_m - px_m^*$	0.249	0.46	-0.924	-1.88	-1.066	-2.52
act^*	2.418	11.57	3.720	13.70	1.146	6.34
vreer5	-0.335	-2.72	0.644	3.07	0.074	0.32
Manufactures Exports Price						Adj R^2=0.85
x_m	0.120	1.78	0.054	1.49	0.015	0.28
$p_D - e_D$	0.641	3.21	0.808	7.87	1.518	17.19
m_f - vtm	-0.421	-3.59	-0.012	-0.11	-0.101	-0.81
Non-Fuel Primary Exports Volume						Adj R^2=0.94
$px_{nfp} - px_{nfp}^*$	0.483	1.04	-1.164	-3.63	-0.256	-0.56
act^*	0.656	4.06	0.799	5.03	-0.039	-0.29
vreer5	-0.102	-0.70	0.066	0.53	0.103	0.70
Non-Fuel Primary Exports Price						Adj R^2=0.75
x_{nfp}	-0.115	-0.94	-0.029	-0.36	-0.528	-6.03
$p_D - e_D$	0.995	4.60	0.844	12.82	1.330	13.42
m_f - vtm	-0.217	-1.37	0.282	2.83	0.455	4.15
Price of Exports						Adj R^2=0.89
px_m^*	0.626	4.67	0.513	4.14	0.582	5.57
px_{nfp}^*	0.650	5.11	0.731	5.88	0.462	3.93
Manufactures Imports Volume						Adj R^2=0.89
$pm_m^* + e_D - p_D$	-0.021	-0.04	-1.341	-3.56	1.275	4.88
r - tmpr	0.743	5.09	0.183	1.70	-0.048	-0.37

TABLE X (Continued)

Fuel Imports Volume							Adj R^2=0.92
$pm_f^* + e_D - p_D$	0.013	0.25	0.007	0.12	0.076	1.71	
r - tmpr	0.366	3.37	0.430	5.16	0.002	0.02	
NonFuel Imports Volume							Adj R^2=0.94
$pm_{nfp}^* + e_D - p_D$	-1.163	-3.78	-1.401	-6.86	0.070	0.29	
gnp	0.321	4.03	0.429	3.99	0.087	0.32	
Price of Imports							Adj R^2=0 98
pm_m^*	0.764	11.62	0.671	10.23	0.698	10.66	
pm_f^*	0.156	5.92	0.251	7.69	0.195	6.95	
pm_{nfp}^*	0.270	3.04	0.018	0.19	0.093	1.06	
Private Consumption							Adj R^2=0.97
m_m	0.358	10.65	0.257	4.32	-0.015	-0.35	
Gross Domestic Investment							Adj R^2=0.98
indust	1.033	19.79	0.933	9.50	0.885	4.81	
capinf - gdpdef	0.029	2.12	0.104	3.10	0.197	6.48	
Domestic Price							Adj R^2=0 66
abs	0.011	2.02	0.022	4.20	0.019	3.74	
tmpr	0.737	12.53	1.061	15.74	0.802	12.68	
Industrialization							Adj R^2=0.94
m_f	0.640	6.14	0.345	3.59	-0.051	-0.34	

the event of a recession in the industrial countries (ACT^*), export volume of ADCs would also fall. The results indicate that economic condition in the industrial world play a significant role in explaining the exports behavior of ADCs. Also, Group I and II countries are relatively more sensitive to economic activity in industrial countries than Group III, a finding discussed by a number of authors cited in Chapter II. Thus, as will be seen in the next section, any changes in ACT^* will have a significant effect on the economies of Group I and II. By contrast, Group III countries would be less affected. Exchange rate variability (VREER5) exerts a negative and significant effect only for Group I (although insignificant for non-fuel primary exports). Evidence indicates that the negative effect of exchange rate risk on trade volumes depends on the structure of merchandise exports.

Traditionally, only the demand side of exports is explained, ignoring the supply side. In the model, both the supply and demand side of exports is modelled and export price and volume are determined simultaneously. The estimated results for export volume are disappointing. This may be due to the instantaneous adjustment assumption and that a more appropriate model is the 'partial adjustment model' used by Khan and Goldstein (1978). Domestic price in foreign currency (P_D/E_D), is significant and of the expected sign in all cases. Thus, the domestic price level plays an important role in explaining the export performance of ADCs. Future research should be directed toward expanding the domestic price level maybe, by developing the monetary side. Finally, the export price of manufactures (PX_m) and (PX_{nfp}) exerts a positive and significant affect on the price of exports (TXPR) in equation (6). Thus, if PX_m and PX_{nfp} changes for any reason, TXPR would also change in the same direction.

Results for manufactures imports volume, show that the coefficient of the price of imports relative to domestic price ($PM_m{}^*E_{D/}P_D$) is negative and significant only in the case of Group II. Real official reserves (R/TMPR) have the expected positive sign and is significant for Group I and Group II countries. The availability of reserves does not seem to pose a constraint on imports for Group III countries. Making real official reserves endogenous in the model might improve the result. In the case of the volume of fuel imports, ($PM_f{}^*E_D/P_D$) is insignificant in all cases. Real official reserves is insignificant for Group III countries. ($PM_{nfp}{}^*E_D/P_D$) in equation for nonfuel primary imports has the correct sign and is significant in Group I and II countries. Gross national product (GNP) is positive and significant in the case of Group I and Group II countries. Except for M_{nfp}, results for relative price variables show that prices are not the key determinant of import volumes in ADCs. In other words, import volume does not respond significantly to changes in relative prices.

The volume of manufactures imports (M_m) exerts a positive effect on private consumption. Therefore, any reduction in the volume of manufactures imports would also reduce private consumption. Industrialization (INDUST) exerts a positive and significant impact on investment for all groups. In addition real long-term capital flows (CAPINF/GDPDEF) exert a positive and significant effect on gross domestic investment. Thus, increasing the flow of long-term capital is beneficial to the economies of ADCs, increasing real domestic investment and ultimately real output. This also shows that real foreign capital flows were a major source of funds for investment in ADCs. For this reason most of the ADCs maintained a higher level of investment level, even during the period of economic turmoil during 1970s.

The import price of manufactures (PM_m^*), fuel (PM_f^*) and nonfuel (PM_{nfp}^*) has a positive and significant effect on the price of imports. The exception is PM_{nfp}^*, which is insignificant for Group II and Group III countries. Absorption yields a positive effect on the domestic price level. In addition, higher import prices result in a higher domestic price. This result is very useful for studying external shocks. For example, if the import price of fuel increases, it would first increase the total price of imports (TMPR). Subsequently, the domestic price (P_D) would increase, which would change exports through equations (1a) and (3a), imports through equations (7), (8) and (9) and ultimately affects GNP. In this way changes in the imported fuel price would spread to the rest of the economy. Finally, the volume of fuel imports (M_f) exerts a positive and significant affect on INDUST, except for Group III countries. This provides the link between changes in fuel imports and gross domestic investment, which changes real absorption (ABS) and ultimately changes the domestic price (P_D). Thus, any increase in the price of imported fuel would have a negative effect on gross domestic investment, ultimately reducing real gross national product (GNP).

Simulation Results

The objective of the simulation experiment is to derive information about the way in which endogenous variables respond to changes in the predetermined variables. According to Challen and Hagger (1983), system simulation consists of a control and shocked run. In the control run, the simultaneous model is solved for the simulation period, a time period which is contained within the sample period used in the estimation of the simultaneous model. Some form of shock is introduced into the model and it is solved again for the same simulation period in the shocked run. The shock often takes the form of changes in the historical time path of one or more predetermined variables. By comparing the solution values for the endogenous variables obtained from the control and shock runs, one can obtain information about the response of the simultaneous model to the shock.

This study uses the Gauss-Seidel method for computing a solution to the system of nonlinear equation. The Gauss-Seidel method substitutes the predicted values from the estimation of the model into the solution variables (endogenous variables solved) immediately after they are computed. Thus, in contrast to other methods, values of the solution variables are not fixed within an iteration. Also, in the Gauss-Seidel method, the order in which equations are specified in the model has an effect on the operation of the iterative solution process. Thus, if the model is block-recursive, the Gauss-Seidel method may converge faster if the equations are grouped by block, and blocks are placed in the block-recursive order (SAS 1988, p. 68).

The external shocks that the economies of ADCs faced during the last two decades were two oil price increases and the subsequent recessions in the industrialized countries. The effects of these external shocks on the balance of payments can be divided into terms of trade and volume of trade effects. The first effect was the deterioration of terms of trade due to higher oil prices, which increased the import bills of

ADCs. The second effect was the constraint on the volume of exports due to recession-induced falling incomes and the reduction of aggregate income in industrialized countries (Naya 1984, p. 3).

A number of studies such as Balassa (1980) and Naya (1984) have measured the impact of external shocks on a country by comparing the historical events with the situation that would have prevailed in the absence of the shocks. However, few studies have used a macroeconometric model to examine the external shocks. Conway (1987) used a macroeconometric model to study the historical experience of Turkey, using econometric estimation and simulation techniques. The simulation methodology used the macroeconometric model to examine the quantitative importance of external shocks and government policy responses in determining aggregate Turkish macroeconomic performance during the 1970s and early 1980s. He calculated the base, or counterfactual solution, which reflects the pre-shock status of the aggregate economy, as a benchmark for comparative dynamics. The economic model is then simulated by changing one variable from base to historical values, and thus measuring its impact in isolation. The resulting changes in the endogenous variables are associated with specific shocks.

Using a similar simulation methodology, the effects of external shocks are examined. The objective is to see the impact of external shocks which ADCs faced during 1968-89. As a first step, the exogenous variables are lagged one period. Using these values, the model is simulated for 1968-89, yielding the control run. Each external shock can be examined by replacing the control (lagged) value of an exogenous variable with its historical values, yielding the shock run. In this, way we can examine the impact of a historical change of an exogenous variable on the economies of ADCs by comparing the control run with the shock run.

The analysis will be restricted to two types of shocks, namely terms of trade and trade volume effects. Two separate simulations for changes in imported fuel prices and foreign economic activity will be used to study these effects. The linkages between these exogenous variables and other variables are shown in Figure 4.

Model Evaluation

According to Challen and Hagger (1983), the most important procedure of evaluating a simultaneous system is the system's within-sample tracking performance or the ability of the system to track the historical time paths of its endogenous variables. This evaluation requires control-run solutions of the endogenous variables, with the simulation period coinciding with the sample period used in the estimation of the system. Historical time paths of the endogenous variables are then compared with the control-run solution value. Simulation errors, defined as the difference between the historical value and the control-run solution value for each variable, are calculated. They are summarized into a single measure of tracking performance, a goodness-of-fit statistic. We define the simulation error, r_{it}, for the i^{th} endogenous variable in time period t, as

$$r_{it} = y_{it} - \tilde{y}_{it}$$

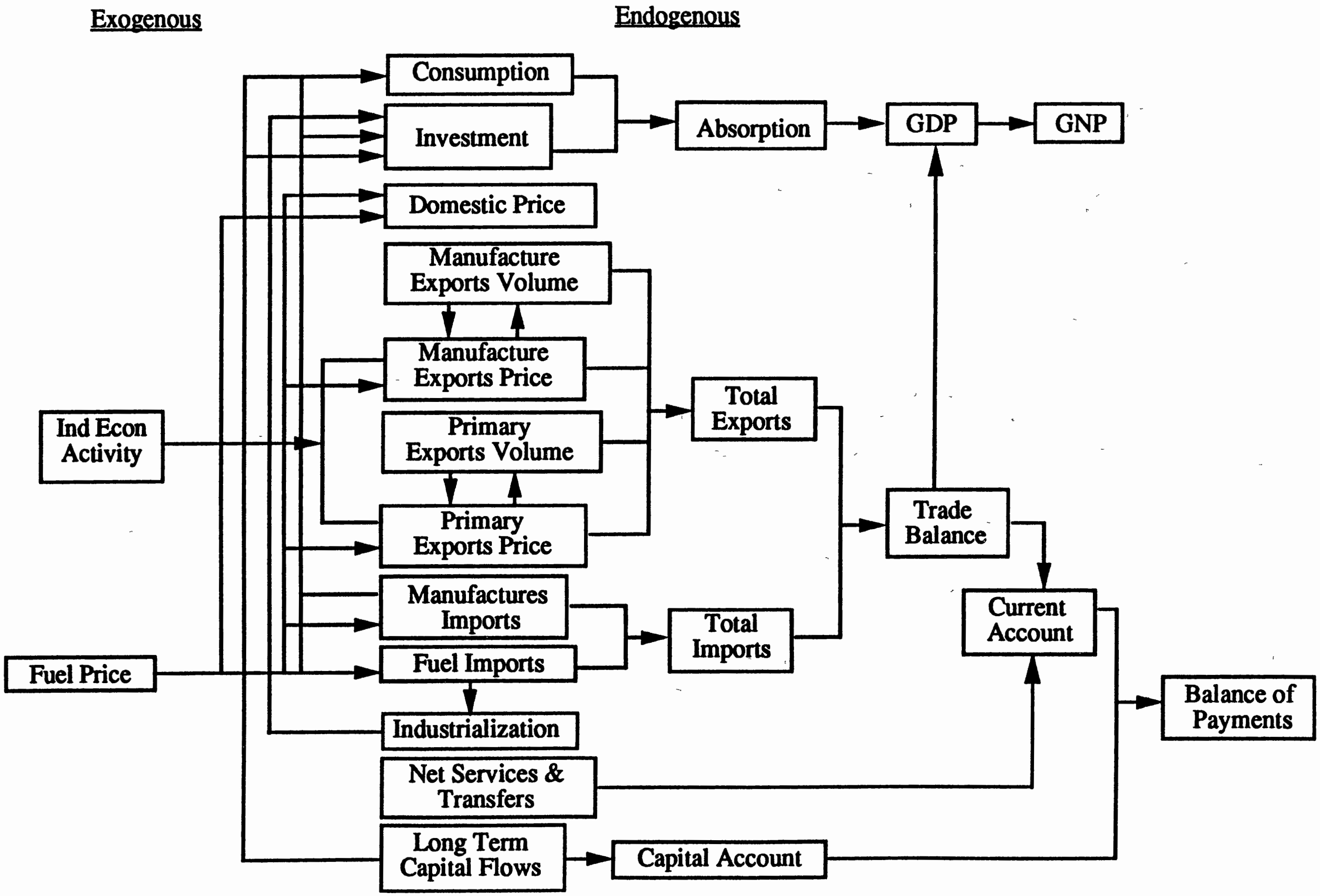

Figure 4. Links Between Exogenous and Endogenous Variables in the Macroeconometric Model

where,

y_{it} = historical value of the endogenous variable i in period t

$\tilde{y}_{it}$ = control-run value of the endogenous variable i in period t

A well-known summary measure of simulation errors is the root mean squared error (RMSE), defined as:

$$RMSE = \sqrt{} sr/n$$

$$\text{where } sr = \sum_{t=1}^{n} r_{it}^2$$

RMSE is expressed in the same units as the endogenous variable. A unit free measure is the root mean squared percentage error (RMSPE), defined as

$$RMSE = 100 \sqrt{} rsp/n$$

$$\text{where } rsp = \sum_{t=1}^{n} r_{it}^2 / y_{it}^2$$

Both RMSE and RMSPE have a lower limit of zero, corresponding to perfect tracking for the endogenous variable concerned. Usually, RMSPE will be preferable to RMSE since it is unit free. However, if the historical values of endogenous variables are very small or if they fluctuate between negative and positive values, the use of RMSPE is not recommended. Another problem with the evaluation of tracking performance using summary measures like RMSE and RMSPE is knowing what their acceptable value is. A benchmark is required which can be gauged from previous studies (Challen and Hagger 1983, pp. 164-167).

The RMSE and RMSPE for the macroeconometric model used in this study are shown in Table XI. The magnitude for these measures are relatively high, showing a poor tracking ability for the model. The sample countries are diverse in nature ranging from large economies such as India to small economies like Nepal and Sri lanka. In addition, data for most developing countries is notoriously inaccurate. A within-sample tracking performance of a model consisting of a diverse sample of countries and inaccurate data, should not be assessed in isolation. Corresponding studies dealing with developing countries should be used as a benchmark to evaluate this model. In the meantime, comparisons were made between different specifications of the macroeconometric model, and the one with the lowest RMSE or RMSPE is chosen for subsequent analysis.

Imported Fuel price

Imported fuel prices increased sharply in 1974 and 1980 and then declined in 1986. The macroeconometric model is simulated for 1968-89 by replacing the control value of M_f^* with its historical value, which we will call the shock run. In addition, since the volume of fuel exports (VX_f) also changes in response to the external shocks during the period, the values of VX_f for the control run were also replaced by their historical values. The simulation results are shown in Table XII for the years 1974, 1980 and 1986. The difference between the values of the endogenous variables from the shock and control runs are expressed as a percent of the values from control run.

The imported fuel price increased by 262 percent in 1974 and 66 percent in 1980 and then fell by 47 percent in 1986. The effects of

TABLE XI

MEASURES OF THE GOODNESS-OF-FIT OF THE MODEL

Variable	RMSE	RMSPE
X_m	0.518	7.745
PX_m	0.339	. .
X_{nfp}	0.362	5.386
PX_{nfp}	0.380	. .
VTX	4377.000	54.085
M_m	0.454	5.517
M_f	0.323	5.058
M_{nfp}	0.451	7.002
VTM	5181.000	41.253
NS	445.746	. .
NTR	171.426	. .
CA	493.298	. .
KA	1594.000	. .
BOP	1561.000	. .
TXPR	0.421	. .
TMPR	0.125	. .
P_D	0.307	. .
C	0.218	2.452
GDOMINV	0.382	4.851
ABS	8184.000	24.541
GNP	9531.000	29.929
INDUST	0.340	4.243

Note: Percent error statistics for 10 variables were set to missing values because an actual value was too close to zero to compute the percent error at one or more observations.

TABLE XII

EFFECTS OF FUEL PRICE SHOCKS ON
ASIAN DEVELOPING COUNTRIES
(Percent Deviation From Control Run)

Country	Year	PM_f^*	VTM	VTX	C	I	GNP
Singapore	1974	261.702	-7.152	-19.575	-5.091	-3.821	-19.112
	1980	66.113	-2.280	-3.497	-2.041	-1.526	-2.754
	1986	-47.835	4.167	10.828	2.680	1.992	13.358
Korea	1974	261.702	-1.044	2.498	-5.091	-3.821	-4.302
	1980	66.113	-0.988	1.317	-2.041	-1.526	-1.220
	1986	-47.835	2.524	0.076	2.680	2.168	1.450
Malaysia	1974	261.702	-6.466	-5.549	-5.091	-3.821	-3.742
	1980	66.113	-2.428	0.773	-2.041	-1.526	0.377
	1986	-47.835	3.829	6.612	2.680	1.992	5.592
Thailand	1974	261.702	26.657	-22.666	10.875	-4.164	-6.139
	1980	66.113	11.607	-7.863	4.158	-1.665	-3.142
	1986	-47.835	-11.391	13.032	-5.092	2.176	4.595
Philippines	1974	261.702	25.927	-23.186	10.879	-4.164	-2.910
	1980	66.113	10.399	-7.673	4.160	-1.665	-1.648
	1986	-47.835	-6.193	15.618	-5.094	2.175	3.449
Indonesia	1974	261.702	42.648	-21.224	10.878	-4.164	-10.556
	1980	66.113	14.019	-5.982	4.157	-1.665	-3.517
	1986	-47.835	-11.799	22.024	-5.091	2.176	8.566
Sri Lanka	1974	261.702	-3.605	-8.300	0.375	-0.368	-0.446
	1980	66.113	-3.817	-22.398	0.148	-0.145	-4.300
	1986	-47.835	7.634	6.978	-0.189	0.187	-2.075
Pakistan	1974	261.702	-9.445	-17.813	0.375	-0.368	0.492
	1980	66.113	-3.680	-8.871	0.148	-0.145	0.000
	1986	-47.835	7.266	13.103	-0.189	0.187	-0.015
India	1974	261.702	-7.975	-23.052	0.375	-0.368	-0.256
	1980	66.113	-3.061	-7.720	0.148	-0.145	0.019
	1986	-47.835	6.278	13.653	-0.189	0.187	0.056
Nepal	1974	261.702	-9.455	-13.289	0.375	-0.368	1.550
	1980	66.113	-4.127	-5.771	0.148	-0.145	0.615
	1986	-47.835	7.804	9.674	-0.189	0.187	-1.155

these shocks vary across different groups of countries. While Singapore, Korea and Malaysia of Group I are severely affected, in terms of GNP, by the increase in fuel price, Sri Lanka, Pakistan, India and Nepal of Group III are only marginally affected by fuel price shocks. As a result of the fuel price increase in 1974 and 1980 (with the exception of Malaysia) GNP declined between 1 percent and 19 percent in Group I countries, whereas in Group III countries, in some cases, GNP actually rose. However, in light of the poor fit of the model for these countries, an increase in GNP can also be attributed to solution errors. An interesting observation can be made regarding the impact of fuel prices on GNP in 1974 as compared to 1980. An increase of 262 percent in imported fuel price in 1974, reduced GNP by 19 percent in Singapore or a 1 percent increase in fuel price resulted in about 0.07 percent decline in GNP. By contrast, in 1980 a 1 percent increase in fuel price reduced GNP by 0.04 percent. This shows some marginal improvement in energy conservation. As expected, given the aggressive energy conservation efforts in most of ADCs countries, especially in Group I countries, GNP growth was less affected by the increase in fuel prices in 1980s. However, the increasing industrialization in ADCs still shows a significant vulnerability to energy imports, as shown by the impact of imported fuel price on industrialization. The main reason for the fall in GNP, especially in Group I countries, is the fall in the total volume of exports (VTX). With the exception of Korea and Malaysia, the volume of exports declined in all ADCs. Fuel imports are crucial for a growing export sector. With the exception of Group II countries, most countries were able to reduce their volume of total imports (VTM) when fuel prices increased. Private consumption (C) and gross domestic investment

(GDOMINV) also declined following a fuel price increase. This shows that in order to adjust to increasing import bills, ADCs reduce their imports, especially luxury consumer and to some extent capital goods, which has a negative effect on GNP.

These fuel price shocks of 1974 and 1980 should be compared to the situation when the fuel price declined by 48 percent in 1986. This will show the model's prediction when imported fuel price changes in the opposite direction. A decline in fuel prices has a positive impact on most ADCs. Again, the experience of Group I countries differs from to that of Group III countries. Group I countries benefit relatively more from the decline in fuel price, as can be seen from the percent increase in GNP.

Malaysia and Indonesia are net fuel exporters. Thus, one should expect that these countries should benefit from an increase in fuel prices. Historically, the volume of fuel exports fell in Malaysia and Indonesia during 1974 and 1980, even though the value of fuel exports rose sharply. The macroeconometric model, deals with the real side of these economies and, therefore, predicts a fall in the volume of fuel exports. One option is to expand the model so as to explain export value and nominal GNP. Another is to add a structural equation for fuel exports, especially for Malaysia and Indonesia. A simple equation for the volume of fuel exports was added to the basic macroeconometric model. However, solutions for this model fail to converge. Even when it converges with an alternative specification, the within-sample tracking performance was very poor. A behavioral equation for the volume of fuel exports was finally dropped from the model. This effect was captured, to some extent, by replacing the control value of the volume of fuel exports with its corresponding historical value.

In summary, Group I countries were more affected by the changes in imported fuel prices as compared to Group III countries. Dependence on fuel imports and energy conservation efforts are the key reasons for the diverse experience of ADCs.

Foreign Economic Activity

The macroeconometric model is again simulated for the period 1968-89, by replacing the control run value for foreign economic activity (ACT^*), in addition to volume of fuel exports, by its corresponding historical values. This shock run is then compared to the control run and is expressed in percent, as shown in Table XIII. ACT^* expresses economic conditions in industrial countries that are the trading partners of ADCs. Each country responds differently to changes in economic condition in the industrial countries (foreign activity). The difference depends on the extent of trade that takes place between the ADCs and countries in the industrial world. For this reason, the values of ACT^* are not the same for the sample countries. However, for most ADCs, ACT^* declined after the two major oil shocks, and following the economic recovery increased in the middle of 1980s. Thus, in order to study trade volume effects, the results are shown for 1974, 1982 and 1986 for most countries.

ACT^* ranges from a decline of 21 percent in Sri Lanka to an increase in Malaysia and Indonesia during 1974. One might note that during the 1970s, Malaysia and Indonesia were major fuel exporters, and thus did not face a reduction in the demand for their exports. But by 1982, ACT^* also declined in these countries. With the exception of Nepal, ACT^* increased during 1986, showing the economic recovery of industrial

TABLE XIII

EFFECTS OF EXPORT VOLUME SHOCKS ON
ASIAN DEVELOPING COUNTRIES
(Percent Deviation From Control Run)

Country	Year	ACT*	VTM	VTX	GNP
Singapore	1974	-5.878	-1.687	-25.685	-32.657
	1982	-4.256	-0.114	-1.720	-2.070
	1986	12.022	2.506	31.649	53.154
Korea	1975	-2.758	-0.231	-5.680	-1.282
	1982	-1.320	-0.033	-2.096	-0.519
	1986	10.273	0.620	25.956	8.153
Malaysia	1974	6.783	-0.148	-5.384	-2.815
	1982	-8.394	-0.054	-1.447	-0.859
	1986	28.618	1.526	30.984	26.148
Thailand	1974	-9.245	-0.110	-13.188	-2.981
	1982	-7.484	-0.141	-11.076	-2.394
	1986	6.793	0.345	15.673	4.757
Philippines	1975	-17.634	-0.120	-19.115	-2.475
	1982	-1.256	-0.021	-2.530	-0.376
	1986	7.196	0.308	15.592	5.390
Indonesia	1974	12.954	-0.351	-16.853	-4.978
	1982	-10.187	-0.037	-1.826	-0.609
	1986	15.987	0.681	26.622	10.121
Sri Lanka	1974	-21.103	0.022	0.532	0.094
	1982	-10.115	-0.011	-1.565	-0.505
	1986	5.412	0.003	0.537	0.223
Pakistan	1974	-3.371	-0.005	-2.375	-0.267
	1982	-8.101	-0.011	-5.660	-0.543
	1986	10.231	0.018	8.280	1.358
India	1974	-2.098	-0.006	-6.712	-0.323
	1982	-5.138	0.003	3.911	0.176
	1986	14.437	0.009	12.052	0.665
Nepal	1974	-1.241	0.000	-0.229	-0.021
	1982	-12.103	-0.003	-2.866	-0.198
	1986	-13.834	-0.016	-9.835	-1.393

countries, (especially the U.S.). The effect of export volume shocks varied across different groups of countries. While GNP fell drastically in a country such as Singapore, countries in Group III were least affected by the changes in economic condition of the industrial countries. The main reason for the reduction in GNP, following the reduction in ACT* during the 1970s and early 1980s, is that it constrained severely the volume of exports: VTX fell in most ADCs.

When the economies of industrial countries recovered in the middle 1980s (as shown by the increase in ACT* during 1986), GNP increased in most of ADCs. However, the increase in GNP was significantly higher in Group I countries than in Group III countries. Thus, the more open, trade-oriented economies of Group I benefited more from the recovery of industrial countries than the relatively closed economies of Group III.

In summary, these results show that the different groups of countries responded differently to the oil price and export volume shocks. Group I countries are more dependent on trade and thus any shock, such as a recession in industrial countries, would have a bigger impact on their economy. However, Group I countries benefit more from the upturn in the economic activity in the industrial countries than the countries of Group III. This result has been confirmed by a number of studies mentioned in the previous chapter. Group I countries are more resilient to the fuel price shock, in part due to domestic policies limiting domestic price increases and energy conservation.

Even though our simulation analysis was restricted to imported fuel price shock and foreign activity shock, this model can be used to examine the effects of other shocks such as changes in the exchange rate, the interest rate charged on long-term loans and others. Also, the same model can be used to examine the adjustment efforts of ADCs during the period of economic turmoil. For example, using the same simulation methodology, we can examine the impact of real foreign capital inflows in improving the economic position of the ADCs in the face of imported fuel shocks or recession in the industrial countries. Thus, this model has potential in explaining the adjustment efforts of the ADCs, and at the same time can be expanded to include those variables which are exogenous in the present model.

CHAPTER IV

SUMMARY AND CONCLUSIONS

Many developing countries were affected by the two oil price increases of the 1970s and the recession in industrial nations in the early 1980s. One of the consequences of these shocks is that oil-importing developing countries suffered a sharp decline in their exports and thereby experienced a severe economic downturn. Evidently, it is crucial to study how changes in the economic environment in industrial countries, such as the United States, and oil price increases impact the developing countries. The impact, however, differs across developing-country geographic groups. In particular, Asian developing countries (ADCs) fared better than the developing countries of Africa and Latin America. Thus, it is important to study the reasons behind the superior performance of ADCs. Moreover, macroeconomic performance differs across the individual developing economies of Asia. Hence, there also is a need to investigate the reasons behind the difference in performance within the group of ADCs.

Most of the research in this area is either a narration of 'stylized facts' or an analysis based on single equation models. When the analysis is restricted to single equation models, essential feedback effects which link the various sectors of an economy are ignored. In this study, a macroeconometric model is constructed for Indonesia, India, Korea, Malaysia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka and Thailand to investigate the adjustment efforts of these countries during 1968-89. These countries are pooled into three groups according to their level of development. The three groups are as follows: Group I consists of Singapore, Korea and Malaysia; Group II consists of Thailand Philippines and Indonesia; and finally Sri Lanka, Pakistan, India and Nepal comprise Group III.

The macroeconometric model is estimated using three-stage least squares and countries are pooled over time with intercept dummies for the countries and slope dummies for the three groups of countries. The results show that foreign demand, dependence on fuel imports and the domestic price level play the major role in explaining the diverse performance of Asian developing countries. The impact of the oil price increase and economic conditions in industrial countries are examined via a series of simulation runs. The main conclusion is that countries in the higher income group display significantly different adjustment responses to economic shocks than the low-income countries. Economic conditions in industrial countries influence significantly the export performance of all of the sample countries with the countries in Group I displaying a much higher sensitivity than those in Group III. Finally, the policies of each group with regard to energy conservation are also significant in explaining the diverse performance among the ADCs.

In future, the macroeconometric model of this study can be modified and expanded in a number of respects. First, more countries could be added to the sample in order to get a better understanding of the diverse economic performance of ADCs. However, the data for additional countries, such as Taiwan, have to be collected from individual country sources because international agencies like the World Bank and IMF do not publish such data. Second, the level of domestic prices, the exchange rate level and regime, external debt, capital inflows and service trade are, in the present study, determined from outside the model. It would enhance the model if, in future, these variables are explained and determined from within the model. To explain the domestic price level, an equation for wholesale prices needs to be added and linked to the rest of the model. The nominal exchange rate can be incorporated so as to maintain the real exchange rate close to its equilibrium level. The choice of an exchange rate regime can be defined by an exchange rate flexibility index, which reflects both the amount of movements in reserves and the exchange rate. Using this index, the model can be used to explain the exchange rate regimes of ADCs. The external debt can be linked to the current account and foreign exchange reserves. Capital inflows can be explained by the level of development and export performance. Finally, the net services and transfers account can be disaggregated, to investigate, for example, the role of workers' remittances in the adjustment process. Service exports and imports can be explained by total exports and imports respectively. A third possible avenue for future research is to capture the effects of external shocks on ADCs over time by including lagged explanatory variables in the model. Finally, in light of the recent emphasis in the financial press on the imbalance of U.S. international trade with ADCs, the model can be modified to investigate bilateral trade between the U.S. and these countries. A model expanded in such a way would assist our understanding of the factors which make up for the imbalance across the different groups of ADCs and allow an investigation of the impact of economic policies (both on the part of the U.S. and the ADCs) on their respective imbalances.

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APPENDICES

APPENDIX A

DESCRIPTIONS OF THE VARIABLES AND THE DATA

ENDOGENOUS VARIABLES

PX_m=Price of Manufactured Exports; source a.

X_m=Export Volume in Manufactures, value of manufactures exports divided by manufactures export price index; source a.

PX_{nfp}=Price of Non-Fuel Food Exports; source a.

X_{nfp}=Volume of Non-Fuel Primary Exports, value of non-fuel primary exports divided by non-fuel primary export price index; source a.

VTX=Volume of Total Exports, value of total exports divided by total export price index; source a.

TXPR=Unit Price of Total Exports; source a.

M_m=Volume of Manufactures Imports, value of manufactures imports divided by international price of manufactures; source a.

M_f=Volume of Fuel Imports, value of fuel imports divided by international price of fuels; source a.

M_{nfp}=Volume of Non-Fuel Primary Imports, total volume of imports minus volume of manufactures and fuel imports.

VTM=Volume of Total Imports, value of total imports divided by total imports price index; source a.

TMPR=Unit Price of Total Imports; source a.

NS=Net Services; source a.

NTR=Net Transfers; source a.

CA=Current Account; source a.

KA=Capital Account; source d.

BOP=Balance of Payments; source d.

P_D=Domestic Price, wholesale price; source c.

C=Private Domestic Consumption; source a.

GDOMINV=Gross Domestic Investment; source a.

ABS=Absorption; source a.

GNP=Gross National Product; source a.

INDUST=Pace of Industrialization, value added in manufacturing; source a.

<u>EXOGENOUS VARIABLES</u>

E_D=Domestic Nominal Exchange Rate, annual average; source c.

PX_m^*=International Price of Manufactures Exports, trade weighted average of export price of manufactures; exports from source e and export price from source a.

ACT^*=Economic Activity in OECD Countries, trade weighted average of real GDP in industrial countries; exports from source e and GDP from c.

VREER5=Exchange Rate Variability, the quarterly REER for country i is defined as $REER_i=((E_iP_i)/P_i^*)$, where E_i is an index of the nominal effective exchange rate and is constructed as a weighted average of the country's bilateral exchange rate with respect to trading partner from industrial countries. P_i^* is a weighted average of partners' wholesale price indices. P_i is the consumer price index of country i. The variability of REER is calculated as the standard deviation of the percentage change in the quarterly value of REER; exchange rate and price data from source c and data on exports from source e.

PX_{nfp}^*=International Price of Nonfuel Primary Exports, trade weighted average of export price of manufactures; exports from source e and export price from source a.

X_f=Volume of Fuel Exports; total volume of exports minus volume of manufactures and non-fuel primary exports.

PM_m^*=International Price of Manufactures; source f.

PM_f^*=International Price of Fuels; source f.

PM_{nfp}^*=International Price of Nonfuel Primary; approx. by PX_{nfp}^*.

XNFS=Non-Factor Services Receipts; source a.

XFS=Factor Services Receipts; source a.

MNFS=Non-Factor Services Payments; source a.

MFS=Factor Services Payments; source a.

i_2=Interest Rate to discount EXTDEBT, external debt divided by longterm interest payment; longterm payment from source a.

EXTDEBT=External Debt; source a.

TRFPRVT=Net Private Current Transfers; Source a.

TRFOFFN=Net Official Transfers; Source a.

XMRCH=Merchandise Exports; Source a.

MMRCH=Merchandise Imports; Source a.

CAPINF=Capital Inflow, sum of longterm and shorterm capital inflow; source d.

RESERVES=Change in Foreign Exchange Reserves; Source a.

EOBP=Error and Omission in Balance of Payments; source d.

GDPDEF=GDP deflator; Source a.

G=Government Consumption; source a.

RXGNFS=Exports of Goods and Nonfactor Services, excl. Volume of Total Exports; Source a.

RMGNFS=Imports of Goods and Nonfactor Services, excl. Volume of Total Imports; Source a.

EONA=Error and Omission in National Account; source a.

<u>Source</u>:

a. World Bank, <u>World Tables</u> Computer Disk 1990.

b. World Bank, <u>World Debt Tables</u> Computer Disk 1990.

c. IMF, <u>International Financial Statistic</u> Computer Tape 1990.

d. IMF, <u>Balance of Payments</u> Computer Tape 1990.

e. IMF, <u>Direction of Trade</u> Computer Tape 1990.

f. GATT, <u>International Trade</u> various issues.

APPENDIX B

DETAILED REGRESSION RESULTS

```
                      The SAS System                          22:26 Thursday, April 9, 1992   1

                      MODEL Procedure

                       Model Summary

              Model Variables          6
                Endogenous             6
              Parameters              85
              Equations                6

              Number of Statements     6

              The SAS System                          22:26 Thursday, April 9, 1992   2

                     MODEL Procedure

           The 5 Equations to Estimate are:

VXMANF  = F( A0(CN1), A1(CN2), A2(CN3), A3(CN4), A4(CN5), A5(CN6), A6(CN7), A7(CN8), A8(CN9), A9(CN10), A10,
             A11, A12, A13, A14, A15, A16, A17, A18 )
XMANFPR = F( B0(CN1), B1(CN2), B2(CN3), B3(CN4), B4(CN5), B5(CN6), B6(CN7), B7(CN8), B8(CN9), B9(CN10), B10,
             B11, B12, B13, B14, B15, B16, B17, B18 )
VXNFP   = F( C0(CN1), C1(CN2), C2(CN3), C3(CN4), C4(CN5), C5(CN6), C6(CN7), C7(CN8), C8(CN9), C9(CN10), C10,
             C11, C12, C13, C14, C15, C16, C17, C18 )
XNFPPR  = F( D0(CN1), D1(CN2), D2(CN3), D3(CN4), D4(CN5), D5(CN6), D6(CN7), D7(CN8), D8(CN9), D9(CN10), D10,
             D11, D12, D13, D14, D15, D16, D17, D18 )
TXPR    = F( N0, N1, N2, N3, N4, N5 )

Instruments: 1 GR2 GR1 CN2 CN3 CN4 CN5 CN7 CN8 CN9 FACT22 FACT21 PD2 PD1 EXCH1 EXCH2 INDUST PGDP2
             PGDP1 VREER51 VREER52 FXMANF2 FXNFP2 VTM XFUELPR POPDENST POP AREA GDP
                      The SAS System                          22:26 Thursday, April 9, 1992   3

                     MODEL Procedure
                     3SLS Estimation

                 3SLS Estimation Summary

              Dataset Option          Dataset
              DATA=                      NEW1

              Parameters Estimated         82

                  Minimization Summary
              Method                    GAUSS
              Iterations                    1

              Final  Convergence  Criteria
              R                             0
              PPC                    2.49E-11
              RPC(D11)               18.77995
              Object               0.07329661
              Trace(S)             0.45967951
              Objective Value      1.92661284

                 Observations Processed
              Read                        197
              Solved                      197

                      The SAS System                          22:26 Thursday, April 9, 1992   4

                     MODEL Procedure
                     3SLS Estimation

          Nonlinear 3SLS Summary of Residual Errors
```

Equation	DF Model	DF Error	SSE	MSE	Root MSE	R-Square	Adj R-Sq
VXMANF	19	178	37.41359	0.21019	0.45846	0.9434	0.9377
XMANFPR	19	178	8.26561	0.04644	0.21549	0.8009	0.7807
VXNFP	19	178	19.16976	0.10770	0.32817	0.9386	0.9324
XNFPPR	19	178	11.25609	0.06324	0.25147	0.6149	0.5759
TXPR	6	191	6.13550	0.03212	0.17923	0.8942	0.8915

Nonlinear 3SLS Parameter Estimates

Parameter	Estimate	Approx. Std Err	'T' Ratio	Approx. Prob>]T]	Label
A0	7.797276	0.48926	15.94	0.0001	MANF EXPORT VOL SGP INTERCEPT
A1	8.087754	0.53380	15.15	0.0001	MANF EXPORT VOL KOR INTERCEPT
A2	6.607993	0.63222	10.45	0.0001	MANF EXPORT VOL MYS INTERCEPT
A3	9.907680	0.90447	10.95	0.0001	MANF EXPORT VOL PHL INTERCEPT
A4	10.293132	0.93505	11.01	0.0001	MANF EXPORT VOL THA INTERCEPT
A5	9.474396	0.90888	10.42	0.0001	MANF EXPORT VOL IDN INTERCEPT
A6	4.853439	1.56520	3.10	0.0022	MANF EXPORT VOL LKA INTERCEPT
A7	6.862068	1.46557	4.68	0.0001	MANF EXPORT VOL PAK INTERCEPT
A8	7.941996	1.76314	4.50	0.0001	MANF EXPORT VOL IND INTERCEPT
A9	3.283445	1.09332	3.00	0.0031	MANF EXPORT VOL NPL INTERCEPT
A10	-1.005299	0.79801	-1.26	0.2094	MANF EXPORT VOL GROUP1 REL PRICE
A11	0.388558	0.89184	0.44	0.6636	MANF EXPORT VOL GROUP2 REL PRICE
A12	-0.366066	0.56015	-0.65	0.5143	MANF EXPORT VOL GROUP3 REL PRICE
A13	3.016096	0.24187	12.47	0.0001	MANF EXPORT VOL GROUP1 FOR ECON ACTIVITY
A14	4.520023	0.33474	13.50	0.0001	MANF EXPORT VOL GROUP2 FOR ECON ACTIVITY
A15	1.369306	0.24573	5.57	0.0001	MANF EXPORT VOL GROUP3 FOR ECON ACTIVITY
A16	-0.307922	0.15216	-2.02	0.0445	MANF EXPORT VOL GROUP1 EXCHANGE RATE VARIABILITY
A17	0.904293	0.26758	3.38	0.0009	MANF EXPORT VOL GROUP2 EXCHANGE RATE VARIABILITY
A18	-0.174978	0.53163	-0.33	0.7424	MANF EXPORT VOL GROUP3 EXCHANGE RATE VARIABILITY
B0	0.254795	1.15759	0.22	0.8260	MANF EXPORT PR SGP INTERCEPT
B1	5.887128	2.78548	2.11	0.0360	MANF EXPORT PR KOR INTERCEPT
B2	-0.110340	1.09154	-0.10	0.9196	MANF EXPORT PR MYS INTERCEPT
B3	0.541821	0.80917	0.67	0.5040	MANF EXPORT PR PHL INTERCEPT
B4	0.919478	0.98388	0.93	0.3513	MANF EXPORT PR THA INTERCEPT
B5	3.112120	1.51343	2.06	0.0412	MANF EXPORT PR IDN INTERCEPT
B6	4.999111	0.71977	6.95	0.0001	MANF EXPORT PR LKA INTERCEPT
B7	4.152286	0.81442	5.10	0.0001	MANF EXPORT PR PAK INTERCEPT
B8	3.653477	0.89661	4.07	0.0001	MANF EXPORT PR IND INTERCEPT
B9	4.718666	0.62083	7.60	0.0001	MANF EXPORT PR NPL INTERCEPT
B10	0.052560	0.09137	0.58	0.5658	MANF EXPORT PR GROUP1 MANF EXPORT VOL
B11	0.055834	0.05149	1.08	0.2796	MANF EXPORT PR GROUP2 MANF EXPORT VOL
B12	0.100122	0.10496	0.95	0.3414	MANF EXPORT PR GROUP3 MANF EXPORT VOL
B13	1.005078	0.27868	3.61	0.0004	MANF EXPORT PR GROUP1 DOMESTIC PRICE
B14	0.681784	0.14454	4.72	0.0001	MANF EXPORT PR GROUP2 DOMESTIC PRICE
B15	1.771440	0.13685	12.94	0.0001	MANF EXPORT PR GROUP3 DOMESTIC PRICE

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MODEL Procedure
3SLS Estimation

Nonlinear 3SLS Parameter Estimates

Parameter	Estimate	Approx. Std Err	'T' Ratio	Approx. Prob>]T]	Label
B16	-0.126400	0.17488	-0.72	0.4708	MANF EXPORT PR GROUP1 FUEL IMPORT / TOTAL IMPORTS
B17	-0.392176	0.18776	-2.09	0.0382	MANF EXPORT PR GROUP2 FUEL IMPORT / TOTAL IMPORTS
B18	0.525860	0.28666	1.83	0.0683	MANF EXPORT PR GROUP3 FUEL IMPORT / TOTAL IMPORTS
C0	7.460087	0.30011	24.86	0.0001	PRIM EXPORT VOL SGP INTERCEPT
C1	6.602899	0.32973	20.03	0.0001	PRIM EXPORT VOL KOR INTERCEPT
C2	8.268190	0.35497	23.29	0.0001	PRIM EXPORT VOL MYS INTERCEPT
C3	7.238567	0.54590	13.26	0.0001	PRIM EXPORT VOL PHL INTERCEPT
C4	7.689380	0.51271	15.00	0.0001	PRIM EXPORT VOL THA INTERCEPT
C5	7.655192	0.49725	15.40	0.0001	PRIM EXPORT VOL IDN INTERCEPT
C6	5.196400	0.97679	5.32	0.0001	PRIM EXPORT VOL LKA INTERCEPT
C7	5.565347	0.93665	5.94	0.0001	PRIM EXPORT VOL PAK INTERCEPT
C8	6.327633	1.09951	5.75	0.0001	PRIM EXPORT VOL IND INTERCEPT
C9	3.518879	0.69497	5.06	0.0001	PRIM EXPORT VOL NPL INTERCEPT
C10	-0.281686	0.72683	-0.39	0.6988	PRIM EXPORT VOL GROUP1 REL PRICE
C11	1.153769	0.80886	1.43	0.1555	PRIM EXPORT VOL GROUP2 REL PRICE
C12	0.244178	0.73567	0.33	0.7403	PRIM EXPORT VOL GROUP3 REL PRICE
C13	1.102777	0.21745	5.07	0.0001	PRIM EXPORT VOL GROUP1 FOR ECON ACTIVITY
C14	0.584557	0.21172	2.76	0.0064	PRIM EXPORT VOL GROUP2 FOR ECON ACTIVITY
C15	0.178449	0.19929	0.90	0.3718	PRIM EXPORT VOL GROUP3 FOR ECON ACTIVITY
C16	-0.190619	0.09596	-1.99	0.0485	PRIM EXPORT VOL GROUP1 EXCHANGE RATE VARIABILITY
C17	-0.240244	0.15697	-1.53	0.1277	PRIM EXPORT VOL GROUP2 EXCHANGE RATE VARIABILITY
C18	-0.492054	0.33545	-1.47	0.1442	PRIM EXPORT VOL GROUP3 EXCHANGE RATE VARIABILITY
D0	3.992922	2.73833	1.46	0.1466	PRIM EXPORT PR SGP INTERCEPT
D1	11.414331	5.05042	2.26	0.0250	PRIM EXPORT PR KOR INTERCEPT
D2	4.104456	3.04109	1.35	0.1788	PRIM EXPORT PR MYS INTERCEPT
D3	3.220924	1.09694	2.94	0.0038	PRIM EXPORT PR PHL INTERCEPT
D4	4.087519	1.20321	3.40	0.0008	PRIM EXPORT PR THA INTERCEPT
D5	6.708815	1.48217	4.53	0.0001	PRIM EXPORT PR IDN INTERCEPT
D6	12.861335	2.17676	5.91	0.0001	PRIM EXPORT PR LKA INTERCEPT
D7	12.353459	2.22721	5.55	0.0001	PRIM EXPORT PR PAK INTERCEPT
D8	13.239669	2.54155	5.21	0.0001	PRIM EXPORT PR IND INTERCEPT
D9	10.032650	1.54889	6.48	0.0001	PRIM EXPORT PR NPL INTERCEPT
D10	-0.347792	0.24443	-1.42	0.1565	PRIM EXPORT PR GROUP1 PRIM EXPORT VOL
D11	-0.260782	0.12434	-2.10	0.0374	PRIM EXPORT PR GROUP2 PRIM EXPORT VOL
D12	-1.065161	0.31083	-3.43	0.0008	PRIM EXPORT PR GROUP3 PRIM EXPORT VOL
D13	1.352181	0.43704	3.09	0.0023	PRIM EXPORT PR GROUP1 DOMESTIC PRICE
D14	0.793365	0.09411	8.43	0.0001	PRIM EXPORT PR GROUP2 DOMESTIC PRICE
D15	1.745377	0.16840	10.36	0.0001	PRIM EXPORT PR GROUP3 DOMESTIC PRICE
D16	0.111266	0.32122	0.35	0.7295	PRIM EXPORT PR GROUP1 FUEL IMPORT / TOTAL IMPORTS
D17	-0.246620	0.21905	-1.13	0.2617	PRIM EXPORT PR GROUP2 FUEL IMPORT / TOTAL IMPORTS
D18	0.767467	0.27822	2.76	0.0064	PRIM EXPORT PR GROUP3 FUEL IMPORT / TOTAL IMPORTS
N0	0.669202	0.13760	4.86	0.0001	PRICE OF TOTAL EXPORTS GROUP1 MANF PRICE
N1	0.536812	0.13954	3.85	0.0002	PRICE OF TOTAL EXPORTS GROUP2 MANF PRICE
N2	0.605616	0.11239	5.39	0.0001	PRICE OF TOTAL EXPORTS GROUP3 MANF PRICE
N3	0.632311	0.13075	4.84	0.0001	PRICE OF TOTAL EXPORTS GROUP1 PRIMARY PRICE
N4	0.712595	0.14174	5.03	0.0001	PRICE OF TOTAL EXPORTS GROUP2 PRIMARY PRICE
N5	0.426814	0.12722	3.35	0.0010	PRICE OF TOTAL EXPORTS GROUP3 PRIMARY PRICE

MODEL Procedure
3SLS Estimation

Number of Observations		Statistics for System	
Used	197	Objective	1.9266
Missing	0	Objective*N	379.5427

MODEL Procedure

Model Summary

Model Variables	5
Endogenous	5
Parameters	57
Equations	5
Number of Statements	6

MODEL Procedure

The 4 Equations to Estimate are:

```
VMMANF = F( E0(CN1), E1(CN2), E2(CN3), E3(CN4), E4(CN5), E5(CN6), E6(CN7), E7(CN8), E8(CN9), E9(CN10), E10, E11,
            E12, E13, E14, E15 )
VMFUEL = F( F0(CN1), F1(CN2), F2(CN3), F3(CN4), F4(CN5), F5(CN6), F6(CN7), F7(CN8), F8(CN9), F9(CN10), F10, F11,
            F12, F13, F14, F15 )
VMNFP  = F( R0(CN1), R1(CN2), R2(CN3), R3(CN4), R4(CN5), R5(CN6), R6(CN7), R7(CN8), R8(CN9), R9(CN10), R10, R11,
            R12, R13, R14, R15 )
TMPR   = F( L0, L1, L2, L3, L4, L5, L6, L7, L8 )
```

Instruments: 1 GR2 GR1 CN2 CN3 CN4 CN5 CN7 CN8 CN9 FACT22 FACT21 PD2 PD1 EXCH1 EXCH2 INDUST PGDP2 PGDP1 VREER51 VREER52 FXNFP2 XFUELPR POPDENST POP AREA GDP FXMANFPR MFUELPR RIGLD

MODEL Procedure
3SLS Estimation

3SLS Estimation Summary

Dataset Option	Dataset
DATA=	NEW1
Parameters Estimated	57

Minimization Summary	
Method	GAUSS
Iterations	1

Final Convergence	Criteria
R	0
PPC	4.69E-10
RPC(R8)	2.511949
Object	0.11048158
Trace(S)	0 49137694
Objective Value	1.23815119

Observations Processed	
Read	197
Solved	197

MODEL Procedure
3SLS Estimation

Nonlinear 3SLS Summary of Residual Errors

Equation	DF Model	DF Error	SSE	MSE	Root MSE	R-Square	Adj R-Sq
VMMANF	16	181	44.80205	0.24753	0.49752	0.8639	0.8526
VMFUEL	16	181	22.81773	0.12606	0.35506	0.9268	0.9207
VMNFP	16	181	20.07427	0.11091	0.33303	0.9308	0.9251
TMPR	9	188	1.29333	0.0068794	0.08294	0.9798	0.9789

Nonlinear 3SLS Parameter Estimates

Parameter	Estimate	Approx. Std Err	'T' Ratio	Approx. Prob>]T]	Label
E0	-5.424325	1.73886	-3.12	0.0021	MANF IMPORT VOL SGP INTERCEPT
E1	7.677048	4.74697	1.62	0.1076	MANF IMPORT VOL KOR INTERCEPT
E2	-5.311625	1.64807	-3.22	0.0015	MANF IMPORT VOL MYS INTERCEPT
E3	11.449023	1.69685	6.75	0.0001	MANF IMPORT VOL PHL INTERCEPT
E4	13.513324	2.15018	6.28	0.0001	MANF IMPORT VOL THA INTERCEPT
E5	20.355050	3.64598	5.58	0.0001	MANF IMPORT VOL IDN INTERCEPT
E6	4.363521	1.18684	3.68	0.0003	MANF IMPORT VOL LKA INTERCEPT
E7	6.350333	1.39115	4.56	0.0001	MANF IMPORT VOL PAK INTERCEPT
E8	7.909958	1.72169	4.59	0.0001	MANF IMPORT VOL IND INTERCEPT
E9	3.313003	1.10575	3.00	0.0031	MANF IMPORT VOL NPL INTERCEPT
E10	-2.017876	0.86563	-2.33	0.0208	MANF IMPORT VOL GROUP1 FOR MANF PRICE
E11	-1.821176	0.49662	-3.67	0.0003	MANF IMPORT VOL GROUP2 FOR MANF PRICE
E12	1.379603	0.38122	3.62	0.0004	MANF IMPORT VOL GROUP3 FOR MANF PRICE
E13	1.798590	0.22652	7.94	0.0001	MANF IMPORT VOL GROUP1 OFFICIAL RESERVES
E14	0.058271	0.16764	0.35	0.7286	MANF IMPORT VOL GROUP2 OFFICIAL RESERVES

E15	-0.232833	0.22157	-1.05	0.2947	MANF IMPORT VOL GROUP3 OFFICIAL RESERVES
F0	3.752864	1.43430	2.62	0.0096	FUEL IMPORT VOL SGP INTERCEPT
F1	4.211368	1.10763	3.80	0.0002	FUEL IMPORT VOL KOR INTERCEPT
F2	2.831829	1.35126	2.10	0.0375	FUEL IMPORT VOL MYS INTERCEPT
F3	3.967970	0.91110	4.36	0.0001	FUEL IMPORT VOL PHL INTERCEPT
F4	3.740866	0.97212	3.85	0.0002	FUEL IMPORT VOL THA INTERCEPT
F5	3.538460	0.95334	3.71	0.0003	FUEL IMPORT VOL IDN INTERCEPT
F6	6.487179	0.80251	8.08	0.0001	FUEL IMPORT VOL LKA INTERCEPT
F7	7.791654	1.01299	7.69	0.0001	FUEL IMPORT VOL PAK INTERCEPT
F8	9.045523	1.25674	7.20	0.0001	FUEL IMPORT VOL IND INTERCEPT
F9	5.104384	0.77396	6.60	0.0001	FUEL IMPORT VOL NPL INTERCEPT
F10	-0.016649	0.06812	-0.24	0.8072	FUEL IMPORT VOL GROUP1 FOR OIL PRICE
F11	0.033714	0.07390	0.46	0.6488	FUEL IMPORT VOL GROUP2 FOR OIL PRICE
F12	0.055005	0.05448	1.01	0.3140	FUEL IMPORT VOL GROUP3 FOR OIL PRICE
F13	0.568611	0.15936	3.57	0.0005	FUEL IMPORT VOL GROUP1 OFFICIAL RESERVES
F14	0.479699	0.12266	3.91	0.0001	FUEL IMPORT VOL GROUP2 OFFICIAL RESERVES
F15	-0.094893	0.14472	-0.66	0.5128	FUEL IMPORT VOL GROUP3 OFFICIAL RESERVES
L0	0.831152	0.08219	10.11	0.0001	PRICE OF TOTAL IMPORTS GROUP1 FOR MANF PRICE
L1	0.659914	0.07822	8.44	0.0001	PRICE OF TOTAL IMPORTS GROUP2 FOR MANF PRICE
L2	0.583902	0.08145	7.17	0.0001	PRICE OF TOTAL IMPORTS GROUP3 FOR MANF PRICE
L3	0.138116	0.03492	3.96	0.0001	PRICE OF TOTAL IMPORTS GROUP1 FOR FUEL PRICE

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MODEL Procedure
3SLS Estimation

Nonlinear 3SLS Parameter Estimates

Parameter	Estimate	Approx. Std Err	'T' Ratio	Approx. Prob>]T]	Label
L4	0.262357	0.03965	6.62	0.0001	PRICE OF TOTAL IMPORTS GROUP2 FOR FUEL PRICE
L5	0.199875	0.03587	5.57	0.0001	PRICE OF TOTAL IMPORTS GROUP3 FOR FUEL PRICE
L6	0.270654	0.10773	2.51	0.0128	PRICE OF TOTAL IMPORTS GROUP1 FOR NONFUEL PRICE
L7	-0.018040	0.11525	-0.16	0.8758	PRICE OF TOTAL IMPORTS GROUP2 FOR NONFUEL PRICE
L8	0.200251	0.10867	1.84	0.0670	PRICE OF TOTAL IMPORTS GROUP3 FOR NONFUEL PRICE
R0	7.771667	1.13752	6.83	0.0001	NONFUEL IMPORT VOL SGP INTERCEPT
R1	21.453699	3.95352	5.43	0.0001	NONFUEL IMPORT VOL KOR INTERCEPT
R2	6.867612	1.17003	5.87	0.0001	NONFUEL IMPORT VOL MYS INTERCEPT
R3	3.735893	1.49204	2.50	0.0132	NONFUEL IMPORT VOL PHL INTERCEPT
R4	5.173507	1.59729	3.24	0.0014	NONFUEL IMPORT VOL THA INTERCEPT
R5	10.053978	2.23698	4.49	0.0001	NONFUEL IMPORT VOL IDN INTERCEPT
R6	3.662299	5.44657	0.67	0.5022	NONFUEL IMPORT VOL LKA INTERCEPT
R7	4.771702	6.25286	0.76	0.4464	NONFUEL IMPORT VOL PAK INTERCEPT
R8	5.798156	7.21088	0.80	0.4224	NONFUEL IMPORT VOL IND INTERCEPT
R9	2.081749	4.81410	0.43	0.6659	NONFUEL IMPORT VOL NPL INTERCEPT
R10	-2.412953	0.52907	-4.56	0.0001	NONFUEL IMPORT VOL GROUP1 FOR NONFUEL PRICE
R11	-1.363232	0.26103	-5.22	0.0001	NONFUEL IMPORT VOL GROUP2 FOR NONFUEL PRICE
R12	0.893240	0.45448	1.97	0.0509	NONFUEL IMPORT VOL GROUP3 FOR NONFUEL PRICE
R13	0.224596	0.10232	2.19	0.0294	NONFUEL IMPORT VOL GROUP1 GNP
R14	0.569777	0.14232	4.00	0.0001	NONFUEL IMPORT VOL GROUP2 GNP
R15	0.015692	0.54833	0.03	0.9772	NONFUEL IMPORT VOL GROUP3 GNP

Number of Observations		Statistics for System	
Used	197	Objective	1.2382
Missing	0	Objective*N	243.9158

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MODEL Procedure

Model Summary

Model Variables	16
Endogenous	16
Parameters	142
Equations	16
Number of Statements	17

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MODEL Procedure

The 9 Equations to Estimate are:

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VXMANF  = F( A0(CN1), A1(CN2), A2(CN3), A3(CN4), A4(CN5), A5(CN6), A6(CN7), A7(CN8), A8(CN9), A9(CN10), A10,
           A11, A12, A13, A14, A15, A16, A17, A18 )
XMANFPR = F( B0(CN1), B1(CN2), B2(CN3), B3(CN4), B4(CN5), B5(CN6), B6(CN7), B7(CN8), B8(CN9), B9(CN10), B10,
           B11, B12, B13, B14, B15, B16, B17, B18 )
VXNFP   = F( C0(CN1), C1(CN2), C2(CN3), C3(CN4), C4(CN5), C5(CN6), C6(CN7), C7(CN8), C8(CN9), C9(CN10), C10,
           C11, C12, C13, C14, C15, C16, C17, C18 )
XNFPPR  = F( D0(CN1), D1(CN2), D2(CN3), D3(CN4), D4(CN5), D5(CN6), D6(CN7), D7(CN8), D8(CN9), D9(CN10), D10,
           D11, D12, D13, D14, D15, D16, D17, D18 )
TXPR    = F( N0, N1, N2, N3, N4, N5 )
VMMANF  = F( E0(CN1), E1(CN2), E2(CN3), E3(CN4), E4(CN5), E5(CN6), E6(CN7), E7(CN8), E8(CN9), E9(CN10), E10,
           E11, E12, E13, E14, E15 )
VMFUEL  = F( F0(CN1), F1(CN2), F2(CN3), F3(CN4), F4(CN5), F5(CN6), F6(CN7), F7(CN8), F8(CN9), F9(CN10), F10,
           F11, F12, F13, F14, F15 )
TMPR    = F( L0, L1, L2, L3, L4, L5, L6, L7, L8 )
VMNFP   = F( R0(CN1), R1(CN2), R2(CN3), R3(CN4), R4(CN5), R5(CN6), R6(CN7), R7(CN8), R8(CN9), R9(CN10), R10,
           R11, R12, R13, R14, R15 )

Instruments: 1 GR2 GR1 CN2 CN3 CN4 CN5 CN7 CN8 CN9 FACT22 FACT21 PD2 PD1 EXCH1 EXCH2 INDUST PGDP2
             PGDP1 VREER51 VREER52 FXNFP2 XFUELPR POPDENST POP AREA GDP FXMANFPR MFUELPR RIGLD
             XNFS XFS MNFS MFS TRFPRVT TRFOFFN XMRCH MMRCH INT2 EXTDEBT GNP GDPDEF RESERVES EOBP1
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MODEL Procedure

3SLS Estimation

3SLS Estimation Summary

Dataset Option	Dataset
DATA=	NEW1

Parameters Estimated 139

Minimization Summary

Method	GAUSS
Iterations	1

Final Convergence Criteria	
R	0
PPC	3.297E-9
RPC(D3)	16.52097
Object	0.08419756
Trace(S)	0.81395212
Objective Value	4.54352246

Observations Processed	
Read	197
Solved	197

MODEL Procedure
3SLS Estimation

Nonlinear 3SLS Summary of Residual Errors

Equation	DF Model	DF Error	SSE	MSE	Root MSE	R-Square	Adj R-Sq
VXMANF	19	178	36.26210	0.20372	0.45135	0.9452	0.9396
XMANFPR	19	178	5.72040	0.03214	0.17927	0.8622	0.8483
VXNFP	19	178	15.47071	0.08691	0.29481	0.9505	0.9455
XNFPPR	19	178	7.80100	0.04383	0.20935	0.7331	0.7061
TXPR	6	191	6.14148	0.03215	0.17932	0.8941	0.8914
VMMANF	16	181	34.45588	0.19036	0.43631	0.8953	0.8866
VMFUEL	16	181	21.69165	0.11984	0.34618	0.9304	0.9246
TMPR	9	188	1.24075	0.0065998	0.08124	0.9806	0.9798
VMNFP	16	181	17.80931	0.09839	0.31368	0.9386	0.9335

Nonlinear 3SLS Parameter Estimates

Parameter	Estimate	Approx. Std Err	'T' Ratio	Approx. Prob>]T]	Label
A0	7.726035	0.45274	17.06	0.0001	MANF EXPORT VOL SGP INTERCEPT
A1	8.060659	0.49342	16.34	0.0001	MANF EXPORT VOL KOR INTERCEPT
A2	6.620214	0.57375	11.54	0.0001	MANF EXPORT VOL MYS INTERCEPT
A3	9.451777	0.81834	11.55	0.0001	MANF EXPORT VOL PHL INTERCEPT
A4	9.487411	0.81091	11.70	0.0001	MANF EXPORT VOL THA INTERCEPT
A5	8.679423	0.78804	11.01	0.0001	MANF EXPORT VOL IDN INTERCEPT
A6	4.773806	0.79629	6.00	0.0001	MANF EXPORT VOL LKA INTERCEPT
A7	6.776141	0.74503	9.10	0.0001	MANF EXPORT VOL PAK INTERCEPT
A8	7.835932	0.89484	8.76	0.0001	MANF EXPORT VOL IND INTERCEPT
A9	3.231153	0.55886	5.78	0.0001	MANF EXPORT VOL NPL INTERCEPT
A10	-0.719526	0.65173	-1.10	0.2711	MANF EXPORT VOL GROUP1 REL PRICE
A11	-1.033115	0.62100	-1.66	0.0979	MANF EXPORT VOL GROUP2 REL PRICE
A12	-0.871793	0.48202	-1.81	0.0722	MANF EXPORT VOL GROUP3 REL PRICE
A13	2.882846	0.22643	12.73	0.0001	MANF EXPORT VOL GROUP1 FOR ECON ACTIVITY
A14	4.107199	0.29960	13.71	0.0001	MANF EXPORT VOL GROUP2 FOR ECON ACTIVITY
A15	1.192903	0.19869	6.00	0.0001	MANF EXPORT VOL GROUP3 FOR ECON ACTIVITY
A16	-0.321441	0.14032	-2.29	0.0231	MANF EXPORT VOL GROUP1 EXCHANGE RATE VARIABILITY
A17	0.738961	0.23943	3.09	0.0024	MANF EXPORT VOL GROUP2 EXCHANGE RATE VARIABILITY
A18	-0.198427	0.26803	-0.74	0.4601	MANF EXPORT VOL GROUP3 EXCHANGE RATE VARIABILITY
B0	-0.644955	0.83899	-0.77	0.4431	MANF EXPORT PR SGP INTERCEPT
B1	3.362754	2.00483	1.68	0.0952	MANF EXPORT PR KOR INTERCEPT
B2	-1.089107	0.78363	-1.39	0.1663	MANF EXPORT PR MYS INTERCEPT
B3	1.485025	0.55987	2.65	0.0087	MANF EXPORT PR PHL INTERCEPT
B4	2.065972	0.68364	3.02	0.0029	MANF EXPORT PR THA INTERCEPT
B5	5.000810	1.04828	4.77	0.0001	MANF EXPORT PR IDN INTERCEPT
B6	4.248435	0.46846	9.07	0.0001	MANF EXPORT PR LKA INTERCEPT
B7	3.636766	0.52495	6.93	0.0001	MANF EXPORT PR PAK INTERCEPT
B8	3.342502	0.56756	5.89	0.0001	MANF EXPORT PR IND INTERCEPT
B9	3.866367	0.39677	9.74	0.0001	MANF EXPORT PR NPL INTERCEPT
B10	0.088276	0.06773	1.30	0.1941	MANF EXPORT PR GROUP1 MANF EXPORT VOL
B11	0.037411	0.03775	0.99	0.3230	MANF EXPORT PR GROUP2 MANF EXPORT VOL

MODEL Procedure
3SLS Estimation

Nonlinear 3SLS Parameter Estimates

Parameter	Estimate	Approx. Std Err	'T' Ratio	Approx. Prob>]T]	Label
B12	0.017994	0.05665	0.32	0.7511	MANF EXPORT PR GROUP3 MANF EXPORT VOL
B13	0.732015	0.20039	3.65	0.0003	MANF EXPORT PR GROUP1 DOMESTIC PRICE
B14	0.835276	0.10472	7.98	0.0001	MANF EXPORT PR GROUP2 DOMESTIC PRICE
B15	1.587921	0.09583	16.57	0.0001	MANF EXPORT PR GROUP3 DOMESTIC PRICE
B16	-0.385640	0.12104	-3.19	0.0017	MANF EXPORT PR GROUP1 FUEL IMPORT / TOTAL IMPORTS
B17	0.00267757	0.11073	0.02	0.9807	MANF EXPORT PR GROUP2 FUEL IMPORT / TOTAL IMPORTS
B18	0.028903	0.12902	0.22	0.8230	MANF EXPORT PR GROUP3 FUEL IMPORT / TOTAL IMPORTS

C0	7.372365	0.26677	27.64	0.0001	PRIM EXPORT VOL SGP INTERCEPT
C1	6.559550	0.29268	22.41	0.0001	PRIM EXPORT VOL KOR INTERCEPT
C2	8.235226	0.31513	26.13	0.0001	PRIM EXPORT VOL MYS INTERCEPT
C3	7.954466	0.46873	16.97	0.0001	PRIM EXPORT VOL PHL INTERCEPT
C4	8.301731	0.43873	18.92	0.0001	PRIM EXPORT VOL THA INTERCEPT
C5	8.311360	0.42599	19.51	0.0001	PRIM EXPORT VOL IDN INTERCEPT
C6	7.437229	0.48908	15.21	0.0001	PRIM EXPORT VOL LKA INTERCEPT
C7	7.597209	0.48150	15.78	0.0001	PRIM EXPORT VOL PAK INTERCEPT
C8	8.831048	0.54888	16.09	0.0001	PRIM EXPORT VOL IND INTERCEPT
C9	5.042679	0.35629	14.15	0.0001	PRIM EXPORT VOL NPL INTERCEPT
C10	0.115034	0.57000	0.20	0.8403	PRIM EXPORT VOL GROUP1 REL PRICE
C11	-0.636043	0.42070	-1.51	0.1323	PRIM EXPORT VOL GROUP2 REL PRICE
C12	-0.227627	0.49272	-0.46	0.6447	PRIM EXPORT VOL GROUP3 REL PRICE
C13	0.946615	0.18200	5.20	0.0001	PRIM EXPORT VOL GROUP1 FOR ECON ACTIVITY
C14	0.756473	0.17242	4.39	0.0001	PRIM EXPORT VOL GROUP2 FOR ECON ACTIVITY
C15	-0.00967204	0.14167	-0.07	0.9456	PRIM EXPORT VOL GROUP3 FOR ECON ACTIVITY
C16	-0.220373	0.08462	-2.60	0.0100	PRIM EXPORT VOL GROUP1 EXCHANGE RATE VARIABILITY
C17	0.00211521	0.13487	0.02	0.9875	PRIM EXPORT VOL GROUP2 EXCHANGE RATE VARIABILITY
C18	0.265695	0.16859	1.58	0.1168	PRIM EXPORT VOL GROUP3 EXCHANGE RATE VARIABILITY
D0	2.479581	1.46449	1.69	0.0922	PRIM EXPORT PR SGP INTERCEPT
D1	8.817529	2.67273	3.30	0.0012	PRIM EXPORT PR KOR INTERCEPT
D2	2.424430	1.62055	1.50	0.1364	PRIM EXPORT PR MYS INTERCEPT
D3	2.728942	0.80114	3.41	0.0008	PRIM EXPORT PR PHL INTERCEPT
D4	3.656356	0.88012	4.15	0.0001	PRIM EXPORT PR THA INTERCEPT
D5	6.788122	1.08542	6.25	0.0001	PRIM EXPORT PR IDN INTERCEPT
D6	9.011079	0.96042	9.38	0.0001	PRIM EXPORT PR LKA INTERCEPT
D7	8.469259	0.95753	8.84	0.0001	PRIM EXPORT PR PAK INTERCEPT
D8	8.955838	1.03775	8.63	0.0001	PRIM EXPORT PR IND INTERCEPT
D9	7.160192	0.74854	9.57	0.0001	PRIM EXPORT PR NPL INTERCEPT
D10	-0.211184	0.13410	-1.57	0.1171	PRIM EXPORT PR GROUP1 PRIM EXPORT VOL
D11	-0.107470	0.08783	-1.22	0.2227	PRIM EXPORT PR GROUP2 PRIM EXPORT VOL
D12	-0.630059	0.10237	-6.15	0.0001	PRIM EXPORT PR GROUP3 PRIM EXPORT VOL
D13	1.145871	0.23225	4.93	0.0001	PRIM EXPORT PR GROUP1 DOMESTIC PRICE
D14	0.849615	0.07089	11.99	0.0001	PRIM EXPORT PR GROUP2 DOMESTIC PRICE
D15	1.480656	0.11306	13.10	0.0001	PRIM EXPORT PR GROUP3 DOMESTIC PRICE
D16	-0.045183	0.17081	-0.26	0.7917	PRIM EXPORT PR GROUP1 FUEL IMPORT / TOTAL IMPORTS
D17	0.280264	0.11468	2.44	0.0155	PRIM EXPORT PR GROUP2 FUEL IMPORT / TOTAL IMPORTS
D18	0.609168	0.12574	4.84	0.0001	PRIM EXPORT PR GROUP3 FUEL IMPORT / TOTAL IMPORTS
N0	0.695662	0.13604	5.11	0.0001	PRICE OF TOTAL EXPORTS GROUP1 MANF PRICE
N1	0.479400	0.13125	3.65	0.0003	PRICE OF TOTAL EXPORTS GROUP2 MANF PRICE
N2	0.645706	0.10640	6.07	0.0001	PRICE OF TOTAL EXPORTS GROUP3 MANF PRICE

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MODEL Procedure
3SLS Estimation

Nonlinear 3SLS Parameter Estimates

Parameter	Estimate	Approx. Std Err	'T' Ratio	Approx. Prob>]T]	Label
N3	0.602739	0.12928	4.66	0.0001	PRICE OF TOTAL EXPORTS GROUP1 PRIMARY PRICE
N4	0.778607	0.13289	5.86	0.0001	PRICE OF TOTAL EXPORTS GROUP2 PRIMARY PRICE
N5	0.382717	0.12004	3.19	0.0017	PRICE OF TOTAL EXPORTS GROUP3 PRIMARY PRICE
E0	-1.312906	1.35724	-0.97	0.3347	MANF IMPORT VOL SGP INTERCEPT
E1	0.00373973	3.55131	0.00	0.9992	MANF IMPORT VOL KOR INTERCEPT
E2	-1.385319	1.28039	-1.08	0.2807	MANF IMPORT VOL MYS INTERCEPT
E3	9.434949	1.26476	7.46	0.0001	MANF IMPORT VOL PHL INTERCEPT
E4	10.813474	1.63836	6.60	0.0001	MANF IMPORT VOL THA INTERCEPT
E5	15.673059	2.89652	5.41	0.0001	MANF IMPORT VOL IDN INTERCEPT
E6	3.587256	0.95225	3.77	0.0002	MANF IMPORT VOL LKA INTERCEPT
E7	5.334990	1.03601	5.15	0.0001	MANF IMPORT VOL PAK INTERCEPT
E8	6.618511	1.22424	5.41	0.0001	MANF IMPORT VOL IND INTERCEPT
E9	2.561424	0.87229	2.94	0.0038	MANF IMPORT VOL NPL INTERCEPT
E10	-0.058136	0.61126	-0.10	0.9243	MANF IMPORT VOL GROUP1 FOR MANF PRICE
E11	-1.238781	0.40562	-3.05	0.0026	MANF IMPORT VOL GROUP2 FOR MANF PRICE
E12	1.322339	0.29935	4.42	0.0001	MANF IMPORT VOL GROUP3 FOR MANF PRICE
E13	1.176217	0.16605	7.08	0.0001	MANF IMPORT VOL GROUP1 OFFICIAL RESERVES
E14	0.167232	0.11829	1.41	0.1592	MANF IMPORT VOL GROUP2 OFFICIAL RESERVES
E15	-0.074123	0.14409	-0.51	0.6076	MANF IMPORT VOL GROUP3 OFFICIAL RESERVES
F0	4.830145	1.05483	4.58	0.0001	FUEL IMPORT VOL SGP INTERCEPT
F1	5.321884	0.86023	6.19	0.0001	FUEL IMPORT VOL KOR INTERCEPT
F2	3.814340	0.99342	3.84	0.0002	FUEL IMPORT VOL MYS INTERCEPT
F3	4.307309	0.64218	6.71	0.0001	FUEL IMPORT VOL PHL INTERCEPT
F4	4.074829	0.69071	5.90	0.0001	FUEL IMPORT VOL THA INTERCEPT
F5	3.820956	0.71694	5.33	0.0001	FUEL IMPORT VOL IDN INTERCEPT
F6	5.815049	0.55501	10.48	0.0001	FUEL IMPORT VOL LKA INTERCEPT
F7	6.968543	0.69342	10.05	0.0001	FUEL IMPORT VOL PAK INTERCEPT
F8	8.037212	0.85817	9.37	0.0001	FUEL IMPORT VOL IND INTERCEPT
F9	4.465858	0.53206	8.39	0.0001	FUEL IMPORT VOL NPL INTERCEPT
F10	-0.050450	0.05512	-0.92	0.3613	FUEL IMPORT VOL GROUP1 FOR OIL PRICE
F11	0.055517	0.06368	0.87	0.3844	FUEL IMPORT VOL GROUP2 FOR OIL PRICE
F12	0.058960	0.04572	1.29	0.1988	FUEL IMPORT VOL GROUP3 FOR OIL PRICE
F13	0.450555	0.11708	3.85	0.0002	FUEL IMPORT VOL GROUP1 OFFICIAL RESERVES
F14	0.433328	0.08558	5.06	0.0001	FUEL IMPORT VOL GROUP2 OFFICIAL RESERVES
F15	0.018623	0.09839	0.19	0.8501	FUEL IMPORT VOL GROUP3 OFFICIAL RESERVES
L0	0.805186	0.07367	10.93	0.0001	PRICE OF TOTAL IMPORTS GROUP1 FOR MANF PRICE
L1	0.657207	0.07336	8 96	0.0001	PRICE OF TOTAL IMPORTS GROUP2 FOR MANF PRICE
L2	0.610542	0.07338	8.32	0.0001	PRICE OF TOTAL IMPORTS GROUP3 FOR MANF PRICE
L3	0.187163	0.02982	6.28	0.0001	PRICE OF TOTAL IMPORTS GROUP1 FOR FUEL PRICE
L4	0.227542	0.03402	6.69	0.0001	PRICE OF TOTAL IMPORTS GROUP2 FOR FUEL PRICE
L5	0.193712	0.03076	6.30	0.0001	PRICE OF TOTAL IMPORTS GROUP3 FOR FUEL PRICE
L6	0.159448	0.09797	1.63	0.1053	PRICE OF TOTAL IMPORTS GROUP1 FOR NONFUEL PRICE
L7	0.099728	0.10176	0.98	0.3284	PRICE OF TOTAL IMPORTS GROUP2 FOR NONFUEL PRICE
L8	0.191234	0.09745	1.96	0.0512	PRICE OF TOTAL IMPORTS GROUP3 FOR NONFUEL PRICE
R0	6.875254	0.84366	8.15	0.0001	NONFUEL IMPORT VOL SGP INTERCEPT
R1	16.261807	2.52194	6.45	0.0001	NONFUEL IMPORT VOL KOR INTERCEPT
R2	6.032687	0.88099	6.85	0.0001	NONFUEL IMPORT VOL MYS INTERCEPT
R3	6.877817	1.17575	5.85	0.0001	NONFUEL IMPORT VOL PHL INTERCEPT

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MODEL Procedure
3SLS Estimation

Nonlinear 3SLS Parameter Estimates

Parameter	Estimate	Approx. Std Err	'T' Ratio	Approx. Prob>]T]	Label
R4	8.397421	1.25844	6.67	0.0001	NONFUEL IMPORT VOL THA INTERCEPT
R5	13.789634	1.76863	7.80	0.0001	NONFUEL IMPORT VOL IDN INTERCEPT
R6	4.126396	2.84521	1.45	0.1487	NONFUEL IMPORT VOL LKA INTERCEPT
R7	4.798982	3.26520	1.47	0.1434	NONFUEL IMPORT VOL PAK INTERCEPT
R8	5.488734	3.76736	1.46	0.1469	NONFUEL IMPORT VOL IND INTERCEPT
R9	2.488992	2.51473	0.99	0.3236	NONFUEL IMPORT VOL NPL INTERCEPT
R10	-1.663715	0.33635	-4.95	0.0001	NONFUEL IMPORT VOL GROUP1 FOR NONFUEL PRICE
R11	-1.420461	0.20971	-6.77	0.0001	NONFUEL IMPORT VOL GROUP2 FOR NONFUEL PRICE
R12	0.319691	0.27603	1.16	0.2483	NONFUEL IMPORT VOL GROUP3 FOR NONFUEL PRICE
R13	0.261460	0.08259	3.17	0.0018	NONFUEL IMPORT VOL GROUP1 GNP
R14	0.269399	0.11258	2.39	0.0177	NONFUEL IMPORT VOL GROUP2 GNP
R15	0.138287	0.28840	0.48	0.6322	NONFUEL IMPORT VOL GROUP3 GNP

Number of Observations		Statistics for System	
Used	197	Objective	4.5435
Missing	0	Objective*N	895.0739

MODEL Procedure

Model Summary

Model Variables	22
Endogenous	22
Parameters	190
OUTVARS Variables	68
Equations	22
Number of Statements	23

MODEL Procedure

The 13 Equations to Estimate are:

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VXMANF  = F( A0(CN1), A1(CN2), A2(CN3), A3(CN4), A4(CN5), A5(CN6), A6(CN7), A7(CN8), A8(CN9), A9(CN10), A10,
             A11, A12, A13, A14, A15, A16, A17, A18 )
XMANFPR = F( B0(CN1), B1(CN2), B2(CN3), B3(CN4), B4(CN5), B5(CN6), B6(CN7), B7(CN8), B8(CN9), B9(CN10), B10,
             B11, B12, B13, B14, B15, B16, B17, B18 )
VXNFP   = F( C0(CN1), C1(CN2), C2(CN3), C3(CN4), C4(CN5), C5(CN6), C6(CN7), C7(CN8), C8(CN9), C9(CN10), C10,
             C11, C12, C13, C14, C15, C16, C17, C18 )
XNFPPR  = F( D0(CN1), D1(CN2), D2(CN3), D3(CN4), D4(CN5), D5(CN6), D6(CN7), D7(CN8), D8(CN9), D9(CN10), D10,
             D11, D12, D13, D14, D15, D16, D17, D18 )
TXPR    = F( N0, N1, N2, N3, N4, N5 )
VMMANF  = F( E0(CN1), E1(CN2), E2(CN3), E3(CN4), E4(CN5), E5(CN6), E6(CN7), E7(CN8), E8(CN9), E9(CN10), E10,
             E11, E12, E13, E14, E15 )
VMFUEL  = F( F0(CN1), F1(CN2), F2(CN3), F3(CN4), F4(CN5), F5(CN6), F6(CN7), F7(CN8), F8(CN9), F9(CN10), F10,
             F11, F12, F13, F14, F15 )
TMPR    = F( L0, L1, L2, L3, L4, L5, L6, L7, L8 )
VMNFP   = F( R0(CN1), R1(CN2), R2(CN3), R3(CN4), R4(CN5), R5(CN6), R6(CN7), R7(CN8), R8(CN9), R9(CN10), R10,
             R11, R12, R13, R14, R15 )
C       = F( G0(CN1), G1(CN2), G2(CN3), G3(CN4), G4(CN5), G5(CN6), G6(CN7), G7(CN8), G8(CN9), G9(CN10), G10,
             G11, G12 )
GDOMINV = F( H0(CN1), H1(CN2), H2(CN3), H3(CN4), H4(CN5), H5(CN6), H6(CN7), H7(CN8), H8(CN9), H9(CN10), H10,
             H11, H12, H13, H14, H15 )
PD      = F( K0, K1, K2, K3, K4, K5 )
INDUST  = F( M0(CN1), M1(CN2), M2(CN3), M3(CN4), M4(CN5), M5(CN6), M6(CN7), M7(CN8), M8(CN9), M9(CN10), M10,
             M11, M12 )

Instruments: 1 GR2 GR1 CN2 CN3 CN4 CN5 CN7 CN8 CN9 FACT22 FACT21 EXCH1 EXCH2 PGDP2 PGDP1 VREER51
             VREER52 FXNFP2 XFUELPR POPDENST POP AREA FXMANFPR MFUELPR RIGLD XNFS XFS MNFS MFS
             TRFPRVT TRFOFFN XMRCH MMRCH INT2 EXTDEBT GNPPCAP GDPDEF RESERVES EOBP1 RXGNFS RMGNFS
             PT1 PT2 PRVCRDT REER NFY
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MODEL Procedure
3SLS Estimation

3SLS Estimation Summary

Dataset Option	Dataset
DATA=	NEW1
OUT=	HISTORY
OUTS=	SMATRIX

Parameters Estimated 187

Minimization Summary	
Method	GAUSS
Iterations	1

Final Convergence Criteria	
R	0
PPC	1.45E-10
RPC(D3)	55.33825
Object	0.14600195
Trace(S)	1.21951551
Objective Value	6.80819319

Observations Processed

Read	197
Solved	197

MODEL Procedure
3SLS Estimation

Nonlinear 3SLS Summary of Residual Errors

Equation	DF Model	DF Error	SSE	MSE	Root MSE	R-Square	Adj R-Sq
VXMANF	19	178	39.55427	0.22221	0.47140	0.9402	0.9341
XMANFPR	19	178	5.65291	0.03176	0.17821	0.8638	0.8500
VXNFP	19	178	16.24755	0.09128	0.30212	0.9480	0.9427
XNFPPR	19	178	6.66514	0.03744	0.19351	0.7719	0.7489
TXPR	6	191	6.13033	0.03210	0.17915	0.8943	0.8916
VMMANF	16	181	34.86353	0.19262	0.43888	0.8941	0.8853
VMFUEL	16	181	22.01839	0.12165	0.34878	0.9293	0.9235
TMPR	9	188	1.27724	0.0067938	0.08242	0.9800	0.9792
VMNFP	16	181	17.07280	0.09432	0.30712	0.9411	0.9363
C	13	184	9.62732	0.05232	0.22874	0.9700	0.9680
GDOMINV	16	181	9.81021	0.05420	0.23281	0.9775	0.9756
PD	6	191	24.84205	0.13006	0.36064	0.6686	0.6599
INDUST	13	184	28.10686	0.15275	0.39084	0.9486	0.9453

Nonlinear 3SLS Parameter Estimates

Parameter	Estimate	Approx. Std Err	'T' Ratio	Approx. Prob>|T|	Label
A0	7.631962	0.39977	19.09	0.0001	MANF EXPORT VOL SGP INTERCEPT
A1	8.076188	0.43504	18.56	0.0001	MANF EXPORT VOL KOR INTERCEPT
A2	6.663540	0.49862	13.36	0.0001	MANF EXPORT VOL MYS INTERCEPT
A3	9.073461	0.71950	12.61	0.0001	MANF EXPORT VOL PHL INTERCEPT
A4	9.189104	0.70420	13.05	0.0001	MANF EXPORT VOL THA INTERCEPT
A5	8 435252	0.68477	12.32	0.0001	MANF EXPORT VOL IDN INTERCEPT
A6	5.571250	0.68180	8.17	0.0001	MANF EXPORT VOL LKA INTERCEPT
A7	7.529542	0.63766	11.81	0.0001	MANF EXPORT VOL PAK INTERCEPT
A8	8.736029	0.76521	11.42	0.0001	MANF EXPORT VOL IND INTERCEPT
A9	3.724401	0.47846	7.78	0.0001	MANF EXPORT VOL NPL INTERCEPT
A10	0.248749	0.54093	0.46	0.6462	MANF EXPORT VOL GROUP1 REL PRICE
A11	-0.924477	0.49144	-1.88	0.0616	MANF EXPORT VOL GROUP2 REL PRICE
A12	-1.066219	0.42260	-2.52	0.0125	MANF EXPORT VOL GROUP3 REL PRICE
A13	2.417807	0.20894	11.57	0.0001	MANF EXPORT VOL GROUP1 FOR ECON ACTIVITY
A14	3.719830	0.27156	13.70	0.0001	MANF EXPORT VOL GROUP2 FOR ECON ACTIVITY
A15	1.145610	0.18063	6.34	0.0001	MANF EXPORT VOL GROUP3 FOR ECON ACTIVITY
A16	-0.334589	0.12302	-2.72	0.0072	MANF EXPORT VOL GROUP1 EXCHANGE RATE VARIABILITY
A17	0.643660	0.20955	3.07	0.0025	MANF EXPORT VOL GROUP2 EXCHANGE RATE VARIABILITY
A18	0.074032	0.22863	0.32	0.7465	MANF EXPORT VOL GROUP3 EXCHANGE RATE VARIABILITY
B0	-1.057745	0.83411	-1.27	0.2064	MANF EXPORT PR SGP INTERCEPT
B1	2.390459	1.99649	1.20	0.2328	MANF EXPORT PR KOR INTERCEPT
B2	-1.464366	0.77749	-1.88	0.0613	MANF EXPORT PR MYS INTERCEPT
B3	1.297894	0.54185	2.40	0.0176	MANF EXPORT PR PHL INTERCEPT
B4	1.835098	0.66277	2.77	0.0062	MANF EXPORT PR THA INTERCEPT
B5	4.676554	1.01946	4.59	0.0001	MANF EXPORT PR IDN INTERCEPT
B6	3.890352	0.41924	9.28	0.0001	MANF EXPORT PR LKA INTERCEPT
B7	3.309454	0.47287	7.00	0.0001	MANF EXPORT PR PAK INTERCEPT

MODEL Procedure
3SLS Estimation

Nonlinear 3SLS Parameter Estimates

Parameter	Estimate	Approx. Std Err	'T' Ratio	Approx. Prob>|T|	Label
B8	3.047923	0.51513	5.92	0.0001	MANF EXPORT PR IND INTERCEPT
B9	3.537457	0.35431	9.98	0.0001	MANF EXPORT PR NPL INTERCEPT
B10	0.119994	0.06733	1.78	0.0764	MANF EXPORT PR GROUP1 MANF EXPORT VOL
B11	0.054073	0.03621	1.49	0.1371	MANF EXPORT PR GROUP2 MANF EXPORT VOL
B12	0.014844	0.05361	0.28	0.7822	MANF EXPORT PR GROUP3 MANF EXPORT VOL
B13	0.641393	0.19981	3.21	0.0016	MANF EXPORT PR GROUP1 DOMESTIC PRICE
B14	0.808330	0.10273	7.87	0.0001	MANF EXPORT PR GROUP2 DOMESTIC PRICE
B15	1.517875	0.08829	17.19	0.0001	MANF EXPORT PR GROUP3 DOMESTIC PRICE
B16	-0.421121	0.11727	-3.59	0.0004	MANF EXPORT PR GROUP1 FUEL IMPORT / TOTAL IMPORTS
B17	-0.011703	0.10300	-0.11	0.9097	MANF EXPORT PR GROUP2 FUEL IMPORT / TOTAL IMPORTS
B18	-0.101127	0.12484	-0.81	0.4190	MANF EXPORT PR GROUP3 FUEL IMPORT / TOTAL IMPORTS
C0	7.305139	0.24514	29.80	0.0001	PRIM EXPORT VOL SGP INTERCEPT
C1	6.478978	0.26871	24.11	0.0001	PRIM EXPORT VOL KOR INTERCEPT
C2	8.142753	0.28886	28.19	0.0001	PRIM EXPORT VOL MYS INTERCEPT
C3	8.130233	0.42807	18.99	0.0001	PRIM EXPORT VOL PHL INTERCEPT
C4	8.448857	0.40032	21.11	0.0001	PRIM EXPORT VOL THA INTERCEPT
C5	8.474829	0.38897	21.79	0.0001	PRIM EXPORT VOL IDN INTERCEPT
C6	6.955384	0.42808	16.25	0.0001	PRIM EXPORT VOL LKA INTERCEPT
C7	7.151255	0.42296	16.91	0.0001	PRIM EXPORT VOL PAK INTERCEPT
C8	8.293483	0.47959	17.29	0.0001	PRIM EXPORT VOL IND INTERCEPT
C9	4.706671	0.31290	15.04	0.0001	PRIM EXPORT VOL NPL INTERCEPT
C10	0.482573	0.46299	1.04	0.2987	PRIM EXPORT VOL GROUP1 REL PRICE
C11	-1.163573	0.32070	-3.63	0.0004	PRIM EXPORT VOL GROUP2 REL PRICE
C12	-0.256441	0.46162	-0.56	0.5792	PRIM EXPORT VOL GROUP3 REL PRICE
C13	0.656259	0.16179	4.06	0.0001	PRIM EXPORT VOL GROUP1 FOR ECON ACTIVITY
C14	0.799456	0.15899	5.03	0.0001	PRIM EXPORT VOL GROUP2 FOR ECON ACTIVITY
C15	-0.036830	0.12915	-0.29	0.7758	PRIM EXPORT VOL GROUP3 FOR ECON ACTIVITY

C16	-0.248689	0.07719	-3.22	0.0015	PRIM EXPORT VOL GROUP1 EXCHANGE RATE VARIABILITY
C17	0.065777	0.12313	0.53	0.5939	PRIM EXPORT VOL GROUP2 EXCHANGE RATE VARIABILITY
C18	0.102559	0.14745	0.70	0.4876	PRIM EXPORT VOL GROUP3 EXCHANGE RATE VARIABILITY
D0	1.355621	1.34922	1.00	0.3164	PRIM EXPORT PR SGP INTERCEPT
D1	6.856723	2.47600	2.77	0.0062	PRIM EXPORT PR KOR INTERCEPT
D2	1.157244	1.49280	0.78	0.4392	PRIM EXPORT PR MYS INTERCEPT
D3	2.097580	0.73052	2.87	0.0046	PRIM EXPORT PR PHL INTERCEPT
D4	2.987694	0.80266	3.72	0.0003	PRIM EXPORT PR THA INTERCEPT
D5	6.096417	0.98972	6.16	0.0001	PRIM EXPORT PR IDN INTERCEPT
D6	7.700937	0.81566	9.44	0.0001	PRIM EXPORT PR LKA INTERCEPT
D7	7.179664	0.81324	8.83	0.0001	PRIM EXPORT PR PAK INTERCEPT
D8	7.601588	0.88206	8.62	0.0001	PRIM EXPORT PR IND INTERCEPT
D9	6.114954	0.63543	9.62	0.0001	PRIM EXPORT PR NPL INTERCEPT
D10	-0.115265	0.12319	-0.94	0.3507	PRIM EXPORT PR GROUP1 PRIM EXPORT VOL
D11	-0.028983	0.08026	-0.36	0.7184	PRIM EXPORT PR GROUP2 PRIM EXPORT VOL
D12	-0.528275	0.08757	-6.03	0.0001	PRIM EXPORT PR GROUP3 PRIM EXPORT VOL
D13	0.995347	0.21635	4.60	0.0001	PRIM EXPORT PR GROUP1 DOMESTIC PRICE
D14	0.844190	0.06583	12.82	0.0001	PRIM EXPORT PR GROUP2 DOMESTIC PRICE
D15	1.330079	0.09913	13.42	0.0001	PRIM EXPORT PR GROUP3 DOMESTIC PRICE
D16	-0.216618	0.15812	-1.37	0.1724	PRIM EXPORT PR GROUP1 FUEL IMPORT / TOTAL IMPORTS
D17	0.281571	0.09967	2.83	0.0053	PRIM EXPORT PR GROUP2 FUEL IMPORT / TOTAL IMPORTS

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MODEL Procedure
3SLS Estimation

Nonlinear 3SLS Parameter Estimates

Parameter	Estimate	Approx. Std Err	'T' Ratio	Approx. Prob>|T|	Label
D18	0.455444	0.10971	4.15	0.0001	PRIM EXPORT PR GROUP3 FUEL IMPORT / TOTAL IMPORTS
N0	0.625957	0.13390	4.67	0.0001	PRICE OF TOTAL EXPORTS GROUP1 MANF PRICE
N1	0.512766	0.12399	4.14	0.0001	PRICE OF TOTAL EXPORTS GROUP2 MANF PRICE
N2	0.582007	0.10448	5.57	0.0001	PRICE OF TOTAL EXPORTS GROUP3 MANF PRICE
N3	0.649756	0.12721	5.11	0.0001	PRICE OF TOTAL EXPORTS GROUP1 PRIMARY PRICE
N4	0.730689	0.12432	5.88	0.0001	PRICE OF TOTAL EXPORTS GROUP2 PRIMARY PRICE
N5	0.461973	0.11759	3.93	0.0001	PRICE OF TOTAL EXPORTS GROUP3 PRIMARY PRICE
E0	2.543849	1.20279	2.11	0.0358	MANF IMPORT VOL SGP INTERCEPT
E1	3.274797	3.09568	1.06	0.2915	MANF IMPORT VOL KOR INTERCEPT
E2	2.195381	1.13391	1.94	0.0544	MANF IMPORT VOL MYS INTERCEPT
E3	9.492788	1.16452	8.15	0.0001	MANF IMPORT VOL PHL INTERCEPT
E4	10.999375	1.51224	7.27	0.0001	MANF IMPORT VOL THA INTERCEPT
E5	16.239112	2.68465	6.05	0.0001	MANF IMPORT VOL IDN INTERCEPT
E6	3.576479	0.85985	4.16	0.0001	MANF IMPORT VOL LKA INTERCEPT
E7	5.272000	0.94323	5.59	0.0001	MANF IMPORT VOL PAK INTERCEPT
E8	6.501169	1.11771	5.82	0.0001	MANF IMPORT VOL IND INTERCEPT
E9	2.478476	0.79004	3.14	0.0020	MANF IMPORT VOL NPL INTERCEPT
E10	-0.020627	0.52901	-0.04	0.9689	MANF IMPORT VOL GROUP1 FOR MANF PRICE
E11	-1.341064	0.37659	-3.56	0.0005	MANF IMPORT VOL GROUP2 FOR MANF PRICE
E12	1.274629	0.26127	4.88	0.0001	MANF IMPORT VOL GROUP3 FOR MANF PRICE
E13	0.743378	0.14593	5.09	0.0001	MANF IMPORT VOL GROUP1 OFFICIAL RESERVES
E14	0.183301	0.10798	1.70	0.0913	MANF IMPORT VOL GROUP2 OFFICIAL RESERVES
E15	-0.047958	0.13085	-0.37	0.7144	MANF IMPORT VOL GROUP3 OFFICIAL RESERVES
F0	5.571564	0.98091	5.68	0.0001	FUEL IMPORT VOL SGP INTERCEPT
F1	5.650150	0.81760	6.91	0.0001	FUEL IMPORT VOL KOR INTERCEPT
F2	4.494334	0.92347	4.87	0.0001	FUEL IMPORT VOL MYS INTERCEPT
F3	4.369192	0.62482	6.99	0.0001	FUEL IMPORT VOL PHL INTERCEPT
F4	4.205937	0.67058	6.27	0.0001	FUEL IMPORT VOL THA INTERCEPT
F5	4.145485	0.68871	6.02	0.0001	FUEL IMPORT VOL IDN INTERCEPT
F6	5.861161	0.54513	10.75	0.0001	FUEL IMPORT VOL LKA INTERCEPT
F7	7.061502	0.68165	10.36	0.0001	FUEL IMPORT VOL PAK INTERCEPT
F8	8.165024	0.84360	9.68	0.0001	FUEL IMPORT VOL IND INTERCEPT
F9	4.498095	0.52297	8.60	0.0001	FUEL IMPORT VOL NPL INTERCEPT
F10	0.012758	0.05122	0.25	0.8036	FUEL IMPORT VOL GROUP1 FOR OIL PRICE
F11	0.00718747	0.06069	0.12	0.9059	FUEL IMPORT VOL GROUP2 FOR OIL PRICE
F12	0.075851	0.04429	1.71	0.0885	FUEL IMPORT VOL GROUP3 FOR OIL PRICE
F13	0.366409	0.10879	3.37	0.0009	FUEL IMPORT VOL GROUP1 OFFICIAL RESERVES
F14	0.430525	0.08344	5.16	0.0001	FUEL IMPORT VOL GROUP2 OFFICIAL RESERVES
F15	0.00199243	0.09674	0.02	0.9836	FUEL IMPORT VOL GROUP3 OFFICIAL RESERVES
L0	0.764149	0.06576	11.62	0.0001	PRICE OF TOTAL IMPORTS GROUP1 FOR MANF PRICE
L1	0.670866	0.06559	10.23	0.0001	PRICE OF TOTAL IMPORTS GROUP2 FOR MANF PRICE
L2	0.698096	0.06546	10.66	0.0001	PRICE OF TOTAL IMPORTS GROUP3 FOR MANF PRICE
L3	0.156024	0.02635	5.92	0.0001	PRICE OF TOTAL IMPORTS GROUP1 FOR FUEL PRICE
L4	0.251188	0.03267	7.69	0.0001	PRICE OF TOTAL IMPORTS GROUP2 FOR FUEL PRICE
L5	0.195326	0.02809	6.95	0.0001	PRICE OF TOTAL IMPORTS GROUP3 FOR FUEL PRICE
L6	0.270046	0.08886	3.04	0.0027	PRICE OF TOTAL IMPORTS GROUP1 FOR NONFUEL PRICE
L7	0.017697	0.09253	0.19	0.8485	PRICE OF TOTAL IMPORTS GROUP2 FOR NONFUEL PRICE
L8	0.093593	0.08835	1.06	0.2908	PRICE OF TOTAL IMPORTS GROUP3 FOR NONFUEL PRICE

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MODEL Procedure
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Nonlinear 3SLS Parameter Estimates

Parameter	Estimate	Approx. Std Err	'T' Ratio	Approx. Prob>|T|	Label
R0	5.946358	0.80511	7.39	0.0001	NONFUEL IMPORT VOL SGP INTERCEPT
R1	12.430200	2.31894	5.36	0.0001	NONFUEL IMPORT VOL KOR INTERCEPT
R2	5.094379	0.84286	6.04	0.0001	NONFUEL IMPORT VOL MYS INTERCEPT
R3	5.208611	1.10074	4.73	0.0001	NONFUEL IMPORT VOL PHL INTERCEPT
R4	6.719948	1.17222	5.73	0.0001	NONFUEL IMPORT VOL THA INTERCEPT
R5	11.906939	1.65030	7.21	0.0001	NONFUEL IMPORT VOL IDN INTERCEPT
R6	5.185666	2.58634	2.01	0.0465	NONFUEL IMPORT VOL LKA INTERCEPT
R7	5.857204	2.98968	1.96	0.0516	NONFUEL IMPORT VOL PAK INTERCEPT
R8	6.597748	3.46390	1.90	0.0584	NONFUEL IMPORT VOL IND INTERCEPT
R9	3.395674	2.28616	1.49	0.1392	NONFUEL IMPORT VOL NPL INTERCEPT
R10	-1.163303	0.30785	-3.78	0.0002	NONFUEL IMPORT VOL GROUP1 FOR NONFUEL PRICE

R11	-1.401152	0.20437	-6.86	0.0001	NONFUEL IMPORT VOL GROUP2 FOR NONFUEL PRICE
R12	0.070162	0.23903	0.29	0.7695	NONFUEL IMPORT VOL GROUP3 FOR NONFUEL PRICE
R13	0.321383	0.07983	4.03	0.0001	NONFUEL IMPORT VOL GROUP1 GNP
R14	0.429029	0.10746	3.99	0.0001	NONFUEL IMPORT VOL GROUP2 GNP
R15	0.087378	0.26946	0.32	0.7461	NONFUEL IMPORT VOL GROUP3 GNP
G0	5.223809	0.31158	16.77	0.0001	PRVT CONSP SGP INTERCEPT
G1	7.254422	0.30606	23.70	0.0001	PRVT CONSP KOR INTERCEPT
G2	6.002914	0.29106	20.62	0.0001	PRVT CONSP MYS INTERCEPT
G3	7.741331	0.49087	15.77	0.0001	PRVT CONSP PHL INTERCEPT
G4	7.577942	0.50459	15.02	0.0001	PRVT CONSP THA INTERCEPT
G5	8.116553	0.53512	15.17	0.0001	PRVT CONSP IDN INTERCEPT
G6	8.127748	0.29173	27.86	0.0001	PRVT CONSP LKA INTERCEPT
G7	9.848370	0.34117	28.87	0.0001	PRVT CONSP PAK INTERCEPT
G8	11.682837	0.37880	30.84	0.0001	PRVT CONSP IND INTERCEPT
G9	7.277976	0.23276	31.27	0.0001	PRVT CONSP NPL INTERCEPT
G10	0.357680	0.03359	10.65	0.0001	PRVT CONSP GROUP1 MANF IMPORT VOL
G11	0.256844	0.05944	4.32	0.0001	PRVT CONSP GROUP2 MANF IMPORT VOL
G12	-0.015280	0.04382	-0.35	0.7277	PRVT CONSP GROUP3 MANF IMPORT VOL
H0	0.076427	0.43563	0.18	0.8609	INVEST SGP INTERCEPT
H1	-0.416505	0.53970	-0.77	0.4413	INVEST KOR INTERCEPT
H2	-0.137806	0.45668	-0.30	0.7632	INVEST MYS INTERCEPT
H3	-0.129809	0.74170	-0.18	0.8613	INVEST PHL INTERCEPT
H4	0.177931	0.72557	0.25	0.8066	INVEST THA INTERCEPT
H5	0.676859	0.75047	0.90	0.3683	INVEST IDN INTERCEPT
H6	0.044082	1.18527	0.04	0.9704	INVEST LKA INTERCEPT
H7	-0.070144	1.46270	-0.05	0.9618	INVEST PAK INTERCEPT
H8	0.129245	1.82800	0.07	0.9437	INVEST IND INTERCEPT
H9	1.041662	0.75162	1.39	0.1675	INVEST NPL INTERCEPT
H10	1.032726	0.05220	19.79	0.0001	INVEST GROUP1 INDUST
H11	0.932850	0.09820	9.50	0.0001	INVEST GROUP2 INDUST
H12	0.885073	0.18414	4.81	0.0001	INVEST GROUP3 INDUST
H13	0.029196	0.01375	2.12	0.0350	INVEST GROUP1 REAL LONGTERM CAP INFLOW
H14	0.103984	0.03354	3.10	0.0022	INVEST GROUP2 REAL LONGTERM CAP INFLOW
H15	0.197050	0.03043	6.48	0.0001	INVEST GROUP3 REAL LONGTERM CAP INFLOW
K0	0.010555	0.0052342	2.02	0.0451	DOMESTIC PRICE GROUP1 ABSORBTION
K1	0.021959	0.0052344	4.20	0.0001	DOMESTIC PRICE GROUP2 ABSORBTION
K2	0.019191	0.0051316	3.74	0.0002	DOMESTIC PRICE GROUP3 ABSORBTION

MODEL Procedure
3SLS Estimation

Nonlinear 3SLS Parameter Estimates

Parameter	Estimate	Approx. Std Err	'T' Ratio	Approx. Prob>]T]	Label
K3	0.737265	0.05883	12.53	0.0001	DOMESTIC PRICE GROUP1 PRICE OF TOTAL IMPORTS
K4	1.060763	0.06739	15.74	0.0001	DOMESTIC PRICE GROUP2 PRICE OF TOTAL IMPORTS
K5	0.801893	0.06325	12.68	0.0001	DOMESTIC PRICE GROUP3 PRICE OF TOTAL IMPORTS
M0	2.095193	0.93322	2.25	0.0260	INDUST SGP INTERCEPT
M1	4.059744	0.89174	4.55	0.0001	INDUST KOR INTERCEPT
M2	3.317200	0.79129	4.19	0.0001	INDUST MYS INTERCEPT
M3	6.084317	0.74745	8.14	0.0001	INDUST PHL INTERCEPT
M4	5.813387	0.75255	7.72	0.0001	INDUST THA INTERCEPT
M5	6.242304	0.72825	8.57	0.0001	INDUST IDN INTERCEPT
M6	6.828338	0.91387	7.47	0.0001	INDUST LKA INTERCEPT
M7	8.370250	1.07436	7.79	0.0001	INDUST PAK INTERCEPT
M8	10.466307	1.24538	8.40	0.0001	INDUST IND INTERCEPT
M9	4.390972	0.69739	6.30	0.0001	INDUST NPL INTERCEPT
M10	0.639672	0.10413	6.14	0.0001	INDUST GROUP1 FUEL IMPORT VOL
M11	0.344743	0.09598	3.59	0.0004	INDUST GROUP2 FUEL IMPORT VOL
M12	-0.050911	0.14968	-0.34	0.7341	INDUST GROUP3 FUEL IMPORT VOL

Number of Observations		Statistics for System	
Used	197	Objective	6.8082
Missing	0	Objective*N	1341

VITA

Tariq L. Jangda

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