AN EMPIRICAL INVESTIGATION OF THE I.M.F. APPROACH TOWARDS MACROECONOMIC ADJUSTMENT IN EGYPT

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DEDICATION

I Dedicate This Thesis:

To the Memory of my Father,

To My Husband and my Childern.

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ABSTRACT

This thesis examines the IMF approach to macroeconomic adjustment in Egypt with, firstly, an empirical assessment of the analytical foundations of this approach and, secondly, the construction and estimation of a small macroeconomic model of the Egyptian economy over the period 1952-86.

Following an overall appraisal of Egyptian macroeconomic performance, with and without the application of Fund financial-supported adjustment programmes (conditionality), the main part of the thesis provides empirical evidence on the determinants of aggregate foreign trade, money supply and money demand and inflation.

Examination of determinants of foreign trade shows that demand for exports is price-elastic, while demand for imports is income-elastic. However, it appears that Egypt's export supply is constrained by capacity. Consequently, devaluation may not play a substantial role towards improving the trade account.

Study of the monetary sector reveals that the money supply is best regarded as endogenous, contrary to the assumption made in the Fund approach. Assuming an endogenous money supply, both stock adjustment-expectations and error correction models of money demand behaviour reveal a well-fitting function.

The IMF view of inflation in LDCs is that it is essentially a monetary phenomenon, i.e. caused by an excess supply of money. Evidence is provided to show that, in addition to money supply growth, structural bottlenecks and expectations are also influential in the inflation process in Egypt and the basic IMF view of inflation should be modified accordingly.

Finally, in order to explain changes in income, prices and balance of payments in Egypt, a small aggregate macroeconomic model is constructed and estimated. Unlike the conventional IMF model, real output is not taken to be predetermined. Estimates of the structural parameters as well as model simulations suggest that the model performs well in tracking the historical values of the dependent variables.

CHAPTER 1

INTRODUCTION

1.1 AN OVERVIEW

Over the last two decades Egypt, like most developing countries, has experienced a number of economic problems, such as slowdown in economic growth, rapid inflation, unemployment, budget deficit and persistent balance of payments deficit. The latter is regarded by International Monetary Fund (IMF) as the direct motive for adjustment in macroeconomic policies of a country. Such a need of adjustment has come to be largely measured by the current account deficit. Salop and Spitaller (1980, p.101) have pointed out that **"the current account has replaced the balance of payments as a barometer of the need for adjustment in the country's macroeconomic policies"**. Moreover, the IMF focuses on the current account position, as the main objective of its adjustment programmes (conditionality) is to achieve " a viable payments position", by which it is meant, especially for many developing countries, **"a current account deficit that can be financed, on a sustainable basis by net capital flows, on terms that are compatible with the development and growth prospects of the country".**[1]

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[1] Guitian (1982, p. 75).

Balance of payments positions of various groups of countries have changed dramatically in the 1970s, particularly after the first rise in oil prices in 1973. However, non-oil developing countries have accounted for the biggest balance of payments problems, as the two main components of current account, i.e. trade account and net services were in deficit throughout the period, as shown in table 1.1 below.

Three main observations can be drawn from table 1.1. Firstly, increases in oil prices in 1974 and 1979-81 have shifted the current account positions of different groups, while industrial countries' current account shifted from surplus to deficit, the deficit in current account of non-oil developing countries increased sharply. In contrast, the surplus in oil-exporting countries' current account rose drastically.

Secondly, an improvement in terms of trade of primary commodities in 1976-1977 resulted in a reduction in the deficit in current account of non-oil developing countries, in the surplus of oil-exporting countries, and a shift from surplus to deficit in industrial countries' current account.

Finally, as oil prices declined in the mid-1980s, the deficit on current account of non-oil developing countries decreased, industrial countries achieved a surplus, while oil-exporting countries have shown a deficit on the current account.

Table 1.1: Summary of Current Account of Major Countries (1973-87)

Billion of US dollar

Years	Industrial Countries			Developing Countries					
				Non-oil exporting			Oil Exporting		
	TA	NS	CA	TA	NS	CA	TA	NS	CA
1973	9.3	16.3	25.6	-10.8	- 0.5	- 11.3	18.8	-12.2	6.6
1974	-23.0	17.3	- 5.7	-33.0	- 3.9	- 36.9	82.1	-14.3	67.8
1975	10.1	6.6	16.7	-40.2	- 5.6	- 45.8	53.4	-18.4	35.0
1976	-14.4	20.5	- 5.1	-26.0	- 6.1	- 32.1	65.3	-25.3	40.0
1977	-18.9	16.7	- 2.2	-25.6	- 4.8	- 30.4	63.3	-33.9	29.4
1978	8.4	24.0	32.4	-37.1	- 5.2	- 42.3	46.0	-40.4	5.7
1979	-36.2	40.1	3.9	-20.2	-20.2	- 71.6	107.8	-45.6	62.2
1980	-66.6	35.4	-31.2	-73.2	-22.9	- 96.1	186.1	-56.4	111.7
1981	-18.8	28.1	9.3	-83.7	-31.6	-115.3	120.3	-68.7	51.7
1982	-13.6	21.9	8.3	-63.7	-36.9	-100.6	70.5	-70.5	00
1983	-17.4	24.5	7.1	-41.7	-35.8	- 77.5	58.0	-60.4	-2.4
1984	-44.4	13.8	-30.6	-19.5	-42.1	- 61.6	68.9	-59.7	9.2
1985	-41.3	21.0	-20.0	-21.4	-40.0	- 61.4	67.8	-51.3	16.3
1986	0.6	30.2	30.8	- 9.9	-38.9	- 48.8	18.6	-42.3	-23.7
1987	- 4.5	38.2	33.7	-18.8	-38.3	- 57.1	30.0	-39.9	- 9.9

TA = trade account.
NS = net service transactions.
CA = current account.
Source: IMF, World Economic Outlook, Various Issues.

As far as Egypt's payments problem is concerned, it seems that the problem is more acute compared with other developing countries. Egypt over the last two decades has had the highest ratio of current account deficit (including unrequired private transfers) to GNP among the developing countries. This percentage for Egypt increased from -5.0 in 1965-73 to -20.9 in 1973-80, and to -25.0 in 1980-86.[2] Moreover, a comparison of Egypt's trade account deficit with the above three groups of countries shows that except for the period 1966-70, Egypt's trade account deficit/GDP ratio was higher than that in various groups of countries, as shown in the table below.

Table 1.2: Ratio of Trade Balance to GDP in Egypt and Various groups of Countries

An annual average (%)

Periods	Industrial Countries	Developing Countries		Egypt
		Non-oil	Oil-exporting	
1956-60	-0.20	-2.68	11.03	- 3.4
1961-65	-0.33	-2.33	12.47	- 8.17
1966-70	-0.39	-2.47	12.82	- 2.35
1971-75	-0.62	-3.84	22.85	- 5.37
1976-80	-1.17	-3.92	20.88	-13.48
1981-85	-1.01	-3.16	8.23	-18.79
1986	-0.63	-2.39	9.41	-15.69
1987	-0.94	-2.77	10.21	-18.87

Source: IMF (1988) IFS Supplement on Trade Statistics, No. 15, pp. 58-61.

[2] World Development Report (1988, p. 193, Table A.11).

It can be seen from table 1.2 that the ratio of deficit on trade balance to GDP in Egypt has been very high relative to that of both industrial and non-oil developing countries. It is also to be noted that this has been occurring despite the fact that Egypt became a net oil exporter in 1977. This problem, however, can be, to a large extent, attributed to the sharp increase in Egypt's imports compared with exports.[3]

In the light of this persistent deterioration in balance of payments, and in order to gain access to international financial markets; non-oil developing counties had to adopt a standard adjustment programme inaugurated by IMF. The main policies of such a programme are monetary and fiscal constraints, trade liberalization and devaluation.[4] The relevance of such policies for balance of payments adjustment in LDCs has been a subject of controversy. Employing a cross-section approach, numerous studies have been undertaken to evaluate the impact of Fund adjustment programmes on the main macroeconomic magnitudes in countries which implemented such programmes.

These programmes have been based on a particular approach developed by the Fund staff. An examination of the relevance of the main assumptions of such an approach to an individual developing country is almost neglected in the literature on

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[3] For details on Egypt's balance of payments, see chapter 2.

[4] see chapter 3 and table A.2 in the appendix for IMF policies in LDCs and in particular for Egypt.

IMF conditionality.

1.2 SCOPE OF THE STUDY

Egypt is one of the developing countries that has adopted IMF adjustment programmes since 1962. The main objective of this study is to investigate empirically the appropriateness of the IMF approach to macroeconomic adjustment in Egypt. This is to be undertaken through examining the main assumptions of the Fund approach to balance of payments adjustment, on which conditionality, or the Fund financial-supported adjustment programme, is based. Econometric methods are to be used to test the responses of exports and imports to price changes and hence devaluation. The assumptions of exogenous and controllable money supply and stable demand for money functions are tested. Also, the IMF view of inflation in LDCs that it is essentially a monetary phenomenon, i.e. caused by excess supply of money is examined in the context of the economy of Egypt.

In order to explain changes in income, prices and balance of payments in Egypt, a small macroeconomic model different from the conventional IMF model, is constructed and estimated using the FIML estimation method for the period 1952-1986.

1.3 OUTLINE OF THE STUDY

The thesis is organized into eight further chapters. Chapter 2 examines the background of the Egyptian economy to identify the major macroeconomic problems experienced since independence in 1952. It contains 6 sections. Section 2.2 provides an overview of the major macroeconomic indicators using graphical presentation. Section 2.3 provides the main changes in macroeconomic policies since 1952. Exchange rate regime shifts are reviewed in section 2.4. Section 2.5 discusses the developments of balance of payments together with the main sources of foreign exchange and the distribution of Egypt's exports and imports by commodity. Main conclusions are given in section 2.6.

The theoretical and empirical macroeconomics of the IMF approach to balance of payments adjustment are illustrated in chapter 3. A general framework of conditionality and its components is discussed in section 3.2. Section 3.3 lays out the theoretical base of the Fund approach to modelling macroeconomic adjustment, with the main criticisms of this approach given in section 3.4. section 3.5 reviews empirical outcomes of the implementation of the Fund adjustment programmes in developing countries. The main policy measures of adjustment programmes applied to Egypt are given in section 3.6. Section 3.7 presents the main conclusions.

In order to investigate the response of Egypt's foreign trade to relative price changes and hence devaluation, Chapter 4 examines the determinants of Egypt's aggregate exports and imports. This is done through an estimation of the demand and supply functions of exports and imports. The main outline of this chapter is as follows: an overview of the literature on the foreign trade is given in section 4.2. In section 4.3 various versions of the demand and supply function of exports are specified. Section 4.4 presents a theoretical specification of the demand and supply function of imports. Empirical results of estimation of export and import equations are presented in section 4.5. Conclusions are given in section 4.6.

Chapter 5 examines the key assumption of the IMF approach that the money supply is exogenous and hence controllable by the authorities. To do this, the main outline of the banking and financial system in Egypt during the study period (1952-86) is considered in section 5.2. Section 5.3 illustrates the components and evolution of the money supply in Egypt over the considered period. Instruments that have been employed by the central bank to control and the effectiveness of some of these instruments are examined in section 5.4. Section 5.5 specifies the theoretical framework of the money supply function. Empirical estimates of this function are reported in section 5.6. Finally, the main conclusions are provided in section 5.7.

An investigation of whether or not there is a stable demand for money function in Egypt during the sample period is considered in chapter 6. Two types of distributed lag model for the demand for money are developed and estimated. The first is a combined stock adjustment and adaptive expectations model. The second is an error correction model. Prior to that the previous evidence on the demand for money in Egypt is reviewed in section 6.2. Section 6.3 discusses the use of stock adjustment and adaptive expectations for demand for money modelling in LDCs. The theoretical specification of various versions of the stock adjustment and adaptive expectation model are discussed in section 6.4. Section 6.5 present the method of estimation and the estimated results of the stock adjustment and adaptive expectations model. The theoretical formulation of the error correction model of the demand for money is given in section 6.6, and its empirical results are reported in section 6.7. Section 6.8 tests the stability of the demand for money function of the two models, using the Chow-test. Section 6.9 presents simulations of the two models of the demand for money over the sample period. Conclusions are given in section 6.10.

The IMF's view that inflation is a monetary phenomenon caused by excess supply of money is examined for Egypt, with reference to LDCs, in chapter 7. Section 7.2 discusses the monetary approach to inflation in LDCs, theory and a brief empirical evidence. The structuralist approach to inflation and the main sectoral bottlenecks through which inflation is generated in LDCs, with reference to Egypt, are examined in section 7.3. Section 7.4 examines the problem of inflation in Egypt, commencing with trends of inflation during the study period in subsection 7.4.1. Previous empirical evidence on inflation in Egypt is reviewed in subsection 7.4.2, with new empirical estimates of the conventional monetary and structural inflation models in Egypt during the sample period. Section 7.5 develops and estimates a broad model of inflation, using the structural lag mechanism in chapter 6, for Egypt during the study period. An extension of the broad inflation model, section 7.6 specifies and estimates a monetary model of inflation in a small open economy. Section 7.7 gives the main conclusions.

Having examined the main hypotheses of the IMF approach to macroeconomic adjustment and identified equations for exports, imports, supply of money, demand for money and inflation that might be appropriate for the Egyptian economy, the next step is an attempt, in chapter 8, to construct a small macroeconomic model that can explain changes in prices, income and balance of payments of Egypt. Section 8.2 specifies the model. The structural parameters of the model are estimated by the most efficient estimator. i.e. FIML, and the results are reported in section 8.3. Dynamic simulations of the model over the sample period are given in section 8.4. Section 8.5 presents the main conclusions.

Finally, the main conclusions of the thesis are summarized in chapter 9. There are also policy implications that can be derived from this thesis, and issues that need further study.

It is to be noted that the feasibility of any econometric results is affected by the quality of the data used. It was difficult to obtain a whole series from one statistical reference, therefore data for some variables had to be obtained from various sources. Some unavailable variables are generated, as shown in the appendix. Also, there were numerous institutional changes during the sample period, such as changes in economic policies, and changes in the end of the financial year. There also were external shocks, such as wars.

CHAPTER 2

THE ECONOMY OF EGYPT
IN THE POST-INDEPENDENCE ERA

2.1 INTRODUCTION

The purpose of this chapter is to identify the major macroeconomic problems experienced by Egypt since its independence in 1952. Section 2.2 provides an overview of the major macroeconomic indicators. Section 2.3 examines the overall changes in macroeconomic policy since 1952. A review of the country's exchange rate system is given in section 2.4. Section 2.5 discusses the developments of components of balance of payments and policies that were employed to finance and adjust the persistent deficit. A summary and concluding remarks are presented in section 2.6.

2.2 MAJOR MACROECONOMIC INDICATORS: AN OVERVIEW

In the post-independence era the performance of the economy of Egypt has been uneven. A graphical approach is employed to illustrate the behaviour of the main economic indicators over the sample period.[1] The variable that measures the deficit on balance of payments is described as the "total currency flow" or the "net basic balance".[2] Changes in total currency flow are financed by changes in official reserves of foreign exchange, loans from the IMF, and other exogenous capital flows which do not affect the money stock. Figure (2.1) illustrates changes in the overall surplus or deficit and in official reserves over the sample period. Fluctuations in overall surplus or deficit and hence in official reserves have become much larger since the late 1970s.

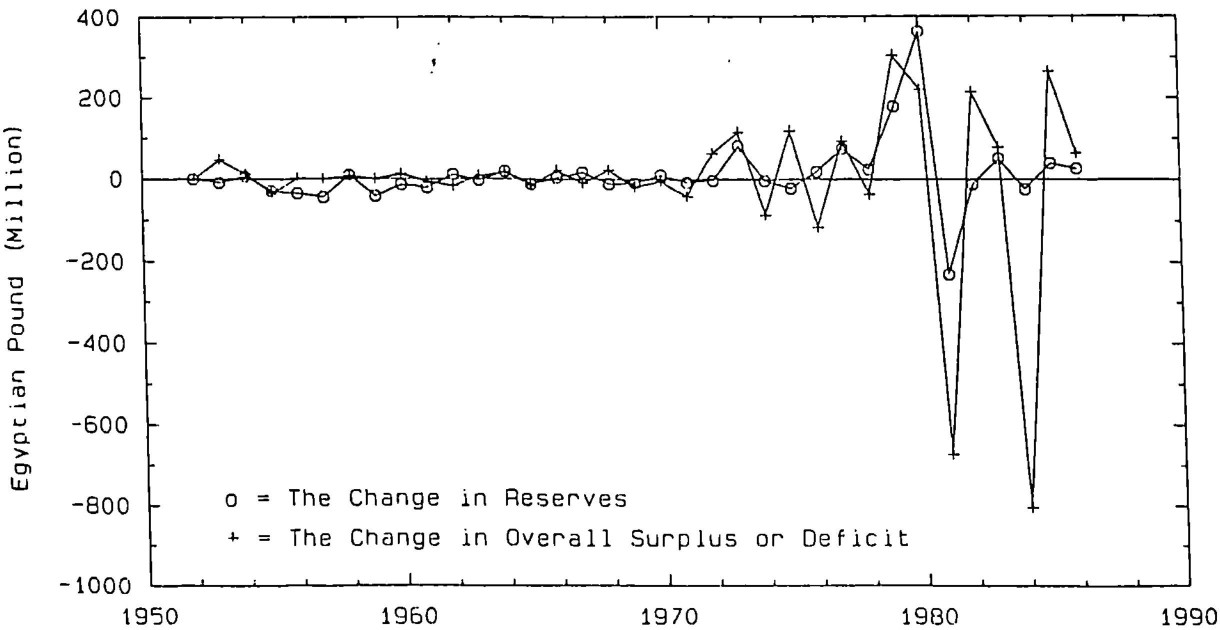

Figure 2.1: **Changes in Overall Surplus or Deficit and Official Reserves**

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[1] Since the sample contains 35 observations, we have seen it could be rather appropriate to use graphs instead of long tables to display the main macroeconomic indicators.

[2] The first definition is used in the official British statistics, and used for empirical estimates by Jones (1976). While the second is used in U.S. statistics. In the Egyptian statistics this variable is measured by "overall surplus or deficit".

The overall surplus or deficit is the sum of other components of the balance of payments, namely the current account and the capital account. Figure (2.2) shows the current account and net capital inflows during the study period. This illustrates that Egypt has only been a net capital exporter in the early 1950s and in the late 1960s. This was mainly due to payments of compensation after the nationalization of foreign properties in the 1950s, and to the stagnation of the development process, and hence additional foreign borrowing in the late 1960s. It is to be noted that during the First Five-Year Plan (1960-65) and the period since the early 1970s onwards, the large current account deficit was reflected in sizeable net capital inflows.

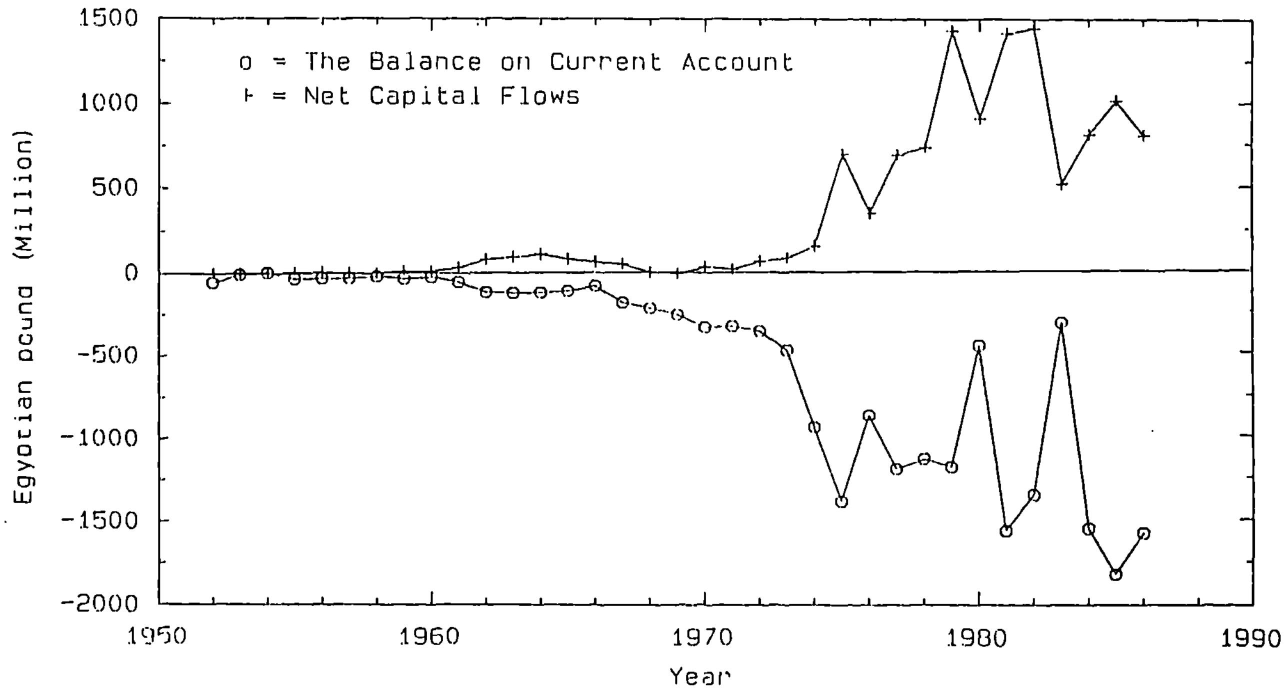

Figure 2.2: The Current Account and Net Capital Flows

Figure (2.3) shows the volume of exports and imports of goods and services. It can be seen that the quantity of imports grew more rapidly than that of exports during the sample period, except in 1986.

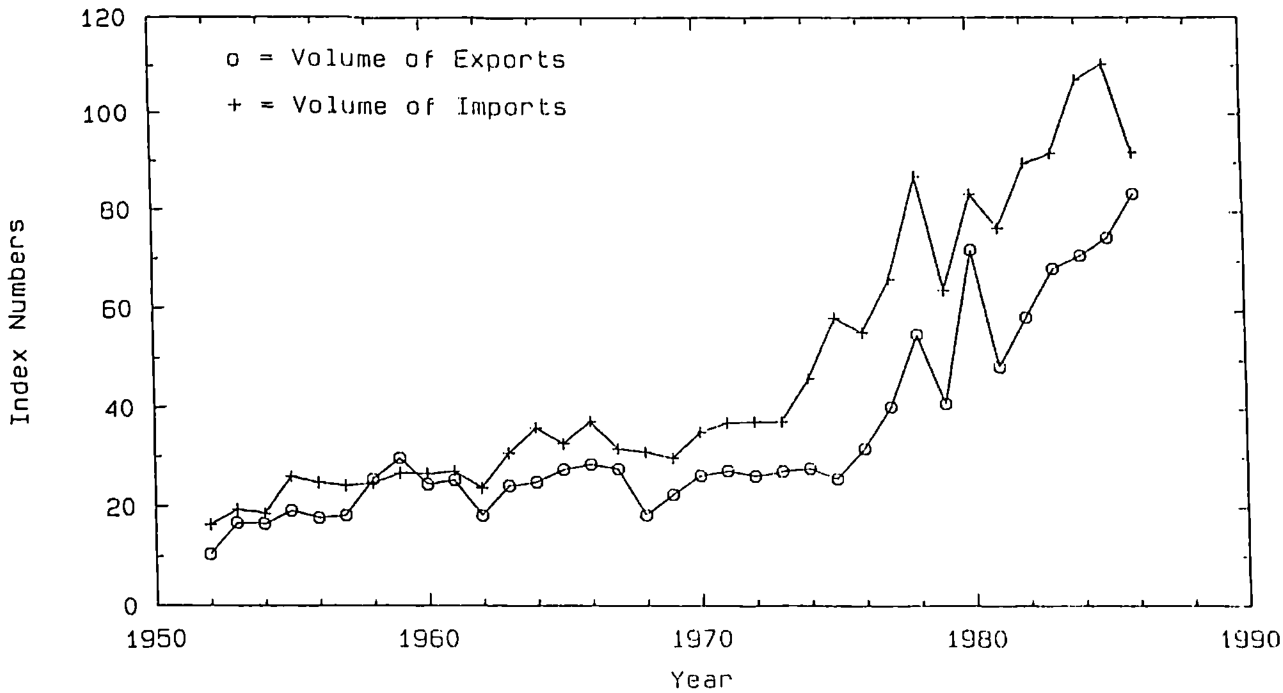

Figure 2.3: Volume of Exports and Imports

Output and domestic expenditure (all in 1980 prices, using CPI as a deflator) are illustrated in figure (2.4). Output (GNP) grew steadily with a slight decline in the rate of growth during the wars before liberalization in 1974. Since then real GNP has been rapidly increasing, but started to decline toward the end of the sample period. It has been pointed out that this growth in output is mainly due to growth in the energy and service sectors, while agriculture and industry sector output fell as a proportion of the total.[3] The behaviour of domestic expenditure is broadly similar to that of output, although the decline toward the end of the study period is larger than that in output.[4]

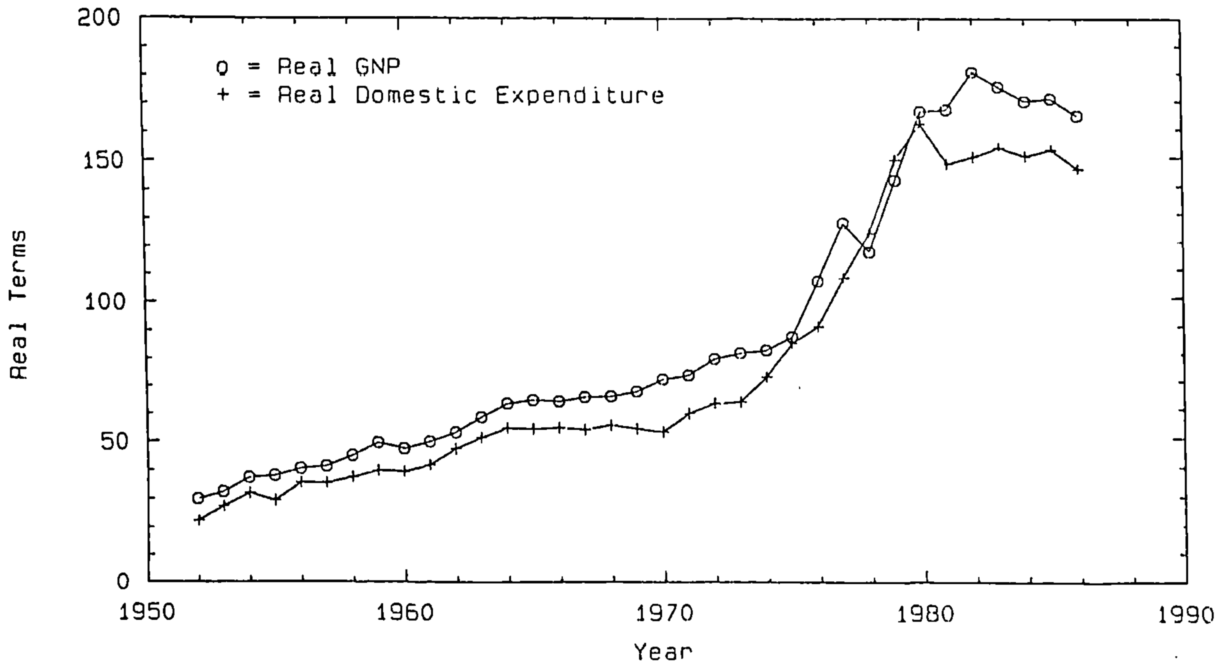

Figure 2.4: **Real GNP and Domestic Expenditure (1980 prices)**

The effects of the sharp increase in total government spending on the budget deficit, and of this deficit on domestic credit expansion are clearly seen in figure (2.5). It is quite clear that increases in the budget deficit, as in most LDCs, are mirrored by domestic credit expansion, particularly from the

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[3] The World Bank (July,1986,p. 1).

[4] Domestic expenditure is equal to private consumption plus total investment.

early 1970s onwards. Domestic credit expansion, on the other hand, resulted in a sharp rise in the stock of money (high-powered money).[5]

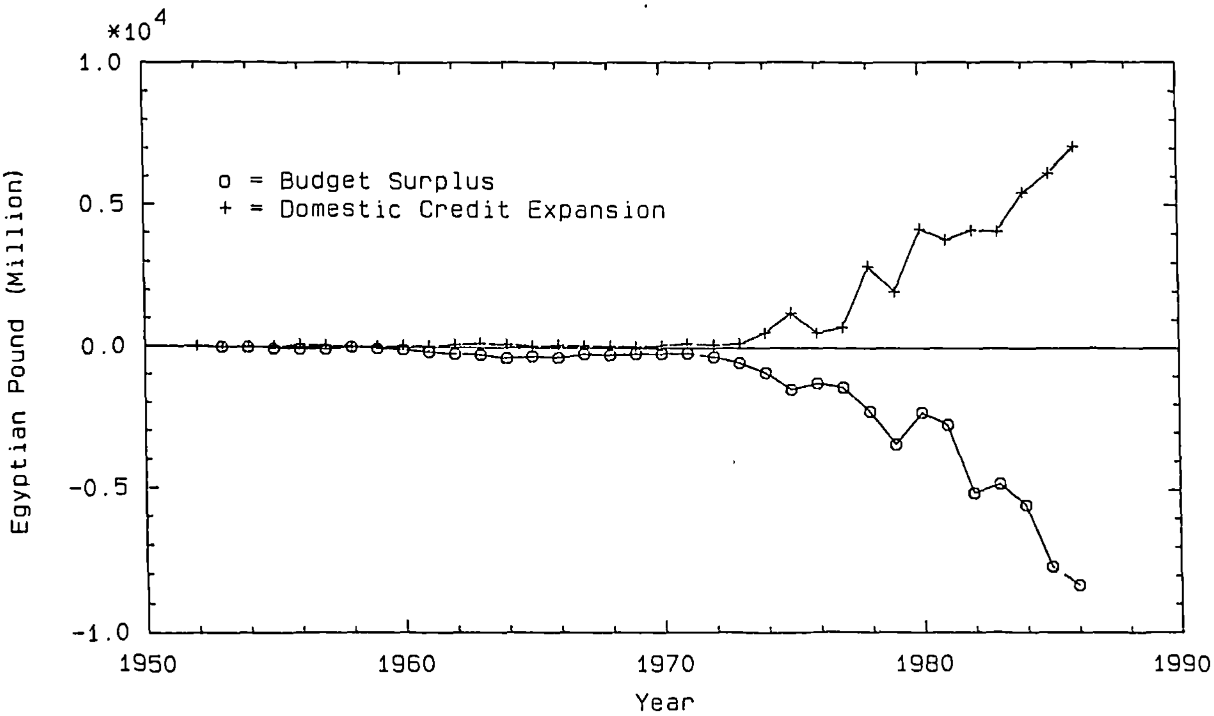

Figure 2.5: Budget Deficit and Domestic Credit Expansion

Figure (2.6) illustrates changes in Egyptian and foreign prices (represented by OECD WPI). There have been always divergences from foreign prices, except for two periods, in the late 1950s and 1960s, but the biggest divergences occurred from the early 1980s onwards, as domestic prices rose faster than foreign prices.

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[5] Money supply behaviour is examined in chapter (5).

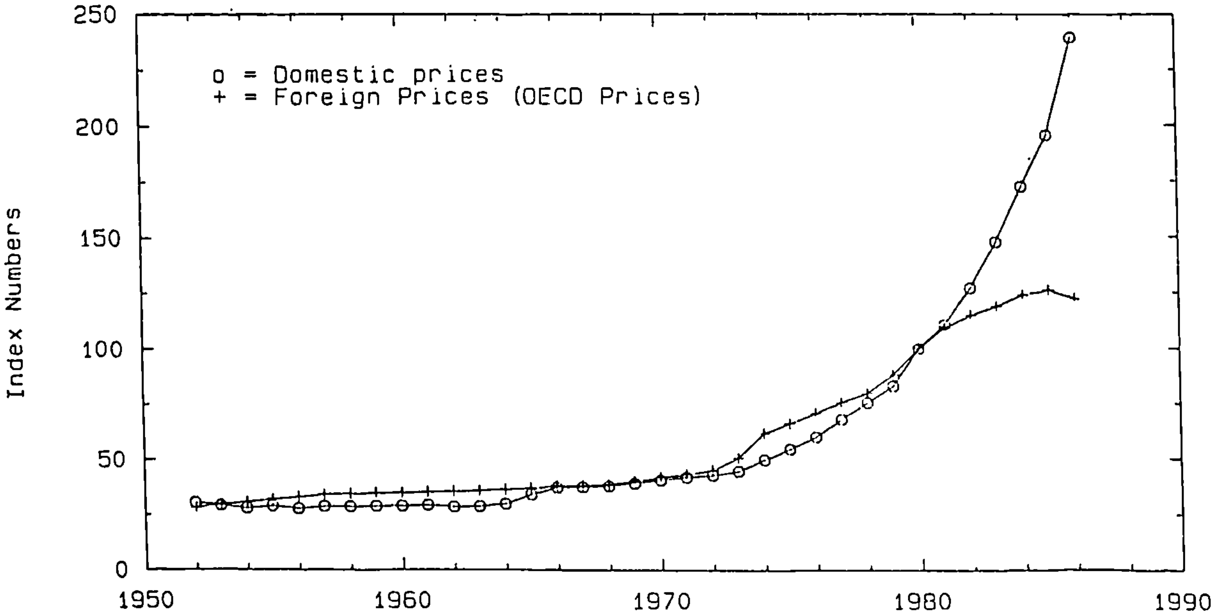

Figure 2.6: Domestic and Foreign Prices

The dismal economic performance of the economy of Egypt during the sample period can be partly attributed to changes in political regimes and hence disruptive shifts in economic policy. There has also been a series of costly wars. However, unlike most less-developed countries (LDCs), Egypt was not adversely affected by the oil price shocks of the 1970s, as the country essentially became a net oil-exporter in 1977. Although, Egypt might have been affected by the first rise in oil prices in 1974, but this was not a major effect as the imports of oil accounted for a small proportion of total imports over the period 1972-76, see table 2.4.

In fact, as a result of the rise in oil prices, the country had extraordinary increases in its foreign exchange earnings from oil exports and remittances of workers in oil Arab countries, as the number of emigrants to these countries increased. Also, Suez Canal dues increased as well as tourism revenues. However, the fall in oil prices in the mid-1980s, might have exacerbated Egypt's economic problems, where foreign exchange earnings became depressed, especially those from oil exports and workers' remittances, real GNP growth declined sharply to -3.5 percent in 1986, and the inflation rate increased.[6]

Furthermore, the budget deficit and balance of payments disequilibrium moved to unsustainable levels in the 1980s. As a consequence, an IMF adjustment programme (Stand-by Arrangement) was adopted in 1987; this was the latest in a sequence of adjustment programmes beginning in 1962. We turn next to changes in economic policy.

2.3 OVERALL MACROECONOMIC POLICIES

In the first five years after the revolution (1952-56), Egyptian macroeconomic policy was virtually a continuation of the previous economic policy of import-substitution

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[6] The estimated rate of inflation in the present study does not exceed 22 percent. However, Abdellah and Brown (1988), and Abdel-Khalek (1987) have given an estimate of about 30% for the rate of inflation.

industrialization in which private enterprises, both domestic and foreign, played a major role.[7] Government intervention in economic policy started as early as the agrarian reform of September 1952, and the decision to build the Aswan High Dam.[8] In addition, there were partial attempts at planning through the Permanent Council for Development of National Production (PCDNP) which was established in 1953.

The actual transition from a private enterprise to a socialist planned economy with a dominant public sector took place in the period 1957-1961. In 1957 foreign properties were nationalized. National enterprises, such as Bank Misr and other industrial enterprises were also nationalized. Finally, in 1961 the biggest wave of nationalization occurred via the Socialist Laws of July 1961. By these laws the state nationalized banking business, insurance companies, heavy industries, all import trade and three-quarters of export trade, and transport.[9]

After 1957, Egyptian macroeconomic policy became a case

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[7] While the public sector accounted for 13 % percent of GDP, the private sector supplied the remaining 87 % (Mead, 1967, pp. 272-73).

[8] The Agrarian Reform Law was amended in 1961; for a comprehensive discussion of the agrarian reforms since 1952,see Mabro (1975, pp. 56-82).

[9] For more details on the transition process, see Issawi (1963), O'Brien (1966), Mead (1967), and Waterbury (1983).

study of the application of two-gap theory, starting in that year with two sectoral five-year plans, one for agriculture and one for industry.

In 1960, however, these plans were replaced with a comprehensive ten-year plan (to be executed in two five-year plans) with an ambitious target of doubling national income. For each five-year plan an overall growth rate was determined as the key economic and social target.[10] Given assumptions about the output/capital ratio, the growth target would require a partcular investment rate. This would imply two gaps to be overcome, namely: a) a foreign exchange gap, to the extent that foreign exchange earnings fell short of import requirements, and b) a saving gap, to the extent that planned national savings fell short of investment. This basic model, augmented with a dynamic multisector input-output framework, was the concern of the National Planning Commission (NPC).[11]

A question may be raised about how these gaps were to be financed. It was expected that a substantial surplus would be achieved by the end of the First Five-Year Plan through both

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[10] In the First Five-Year Plan (1959/60-1964/65) the national income was expected to grow by 40 %, and to double by the end of the Second Five-Year Plan (1965/66-1969/70).

[11] However, Hansen and Marzouk (1965, p.303) point out that the sectoral targets were determined in a rather intuitive way because of the unsuccessful Leontief input-output model applied to Egypt. This might due to inadequate data rather than to incorrect model specification.

import substitution and increases in exports, both agricultural and manufactured commodities. The plan also tended to take private domestic and foreign savings as given, and concentrated on increasing public savings.[12] It was also assumed that the exchange rate would remain fixed, and that import restrictions would be used, as necessary, against imports of consumer goods to allocate foreign exchange towards imports of investment and capital goods. This approach operated relatively effectively up to the end of the First Five-Year Plan (1965), producing an annual average real growth of 6.4 percent and an inflation rate of 5 percent.

However, foreign exchange crises arose in 1962, as Egypt's foreign reserves were completely exhausted, and the country had to seek credit from the IMF to face balance of payments difficulties, and the pound was devalued by 25 % in 1962.[13] The foreign exchange crises were aggravated by the prevention of the United State's PL 480 sales of wheat in 1965, as the country had to import this wheat for convertible currencies. By 1966 the country was unable to fulfil its contractual external debt service obligations, and hence foreign short-term borrowing increased (for more details, see Ikram,1980).

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[12] Private domestic saving was calculated as a residual, and foreign capital loans and grants were estimated to be a third of the plan investment.

[13] The balance of payments and arrangements with the IMF are examined later in this chapter.

The second five-year plan (1964/65-1969/70) was halted both by foreign exchange crises and the 1967 war. However, there was a series of annual investment programmes.[14]

Table 2.1: Summary of Selected Economic Indicators of The Egyptian Economy:1952-86

Annual average

periods	Growth rate (Real GDP)	Inflation Rate	CA/GDP %	Inv/GDP %	GEX/GDP %	FD/GD %
1952-56	10.5	-2.2	2.7	1.5	15.4	3.3
1957-61	3.5	1.6	2.4	13.2	16.1	5.3
1962-66	5.2	4.8	5.9	17.9	19.2	15.7
1967-71	2.9	2.4	5.5	13.4	23.0	7.9
1972-76	6.7	7.1	10.8	19.4	26.1	19.1
1977-81	8.0	12.1	8.0	30.8	18.4	20.8
1982-86	0.6	15.5	4.2	25.0	17.2	21.9

Source: Calculated from Central Bank of Egypt "Economic Review", various Issues ,and IMF, IFS, Various issues.
CA/GDP = current account deficit/ GDP ratio.
Inv/GDP= total investment/GDP ratio.
GEX/GDP= government expenditure/GDP ratio.
FD/GDP = fiscal deficit/GDP ratio.

Consequently, in the inter-war period (1967-73) the economy ran into recession. As can be seen from table (2.1) the government spending to GDP ratio increased because of increased defence spending. However, all economic indicators were depressed. The country also lost considerable sources of

[14] It has been pointed out that even these annual investment programmes were not fully implemented, see Ikram (1980, p. 22), and Waterbury (1983, p112).

foreign exchange, as the Suez Canal was closed in 1967, and petroleum fields in Sina were occupied.

Despite some assistance provided by Arab countries to compensate for the loss of Suez Canal revenues, short-term borrowing was continued so as to finance purchases of essential goods.[15] The problem of servicing such short-term debt recurred in the early 1970s. As a consequence of this problem a fundamental shift occurred in economic policy from a controlled to a liberalized open orientation, via the launching of the Open-Door Policy by law 43 of 1974, which was amended by Law 32 of 1977.[16]

Generally, the open-door economic policy was aimed at attracting Arab and foreign investment in projects that would be self-sufficient in foreign exchange and that would promote Egyptian exports, bring in advanced technology and management

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[15] Arab assistance to compensate for the loss of Suez Canal revenues was decided by the Khartoum Agreement 1968 at a level of $ 250 million a year (for more details see Ikram,1980).

[16] There were earlier attempts to create an attractive environment for foreign investment through Law 65 of 1971 on investing in Arab capital and Free Zones. But a wide open-door policy was introduced through the President Sadat's October Paper. This paper was presented to the People's Assembly in April 1974 and approved in May. In this paper an outline for redirection in both economic and political policies was set out. For a comprehensive discussion on the creation of the open door policy,see Abdel-Khalek (1981). Bruton (1981), Ikram (1980), and Waterbury (1983).

techniques, and substitute for imports. In addition, this policy put an end to the public sector monopoly, and to the state monopoly of the banking sector.[17] Thus, the country moved towards an export-led growth strategy in the mid-1970s.

As mentioned above Egypt was not adversely affected by the 1970s external shocks, at least the second surge in the oil prices. However, unlike Turkey, Egyptian workers' remittances have not caused a surplus in current account.[18] Thus, apart from a short recovery during the second rise in the price of oil, the economy ran into recession because of the reduction in foreign exchange earnings.[19] Furthermore, the country's external debt increased rapidly from $ 1,713 million in 1970 to $ 40,264 million in 1987. Also the debt/GNP ratio reached 108.7 percent and debt service ratio was 18.5 % in 1987.[20] The inability to repay the services of such debt arose in 1976. By that time a series of negotiations of debt rescheduling commenced, leading to undertaking of further IMF stabilization policies in 1977, which was followed by riots. It is also to be noted that the open-door policy has not

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[17] Developments in the banking and financial sector in Egypt over the study period are reviewed in chapter (5).

[18] Dervis and Petri (1987) have argued that increases in the remittances of Turkish workers in Europe have participated in achieving a surplus in Turkey's current account.

[19] Foreign exchange resources are explained later in this chapter.

[20] World Development Report, 1989.

achieved substantial increases in exports, nor in import substitutes. On the contrary, imports dramatically increased, and hence the current account difficulties, which are examined in the next section, have worsened. Such a drastic surge in imports could partly be attributed to the extraordinary increases in foreign exchange earnings, but the import liberalization policies which accompanied the open door policy and the access of the public to foreign exchange deposits contributed more to this problem (for more details on these policies, see Abdel-Khalek, 1981, and Wilson, 1984).[21] The capital account, on the other hand, has shown some improvements, as can be seen from table 2.2 below. However, such an improvement in the net capital inflows was, to a large extent, due to external borrowings rather than to foreign investments.

2.4 TRENDS OF BALANCE OF PAYMENTS

Table (2.2) presents a summary of Egypt's balance of payments over the study period, 1952-1986. The balance on current account as a measurement of balance of payments position, shows that Egypt's balance of payments has been in an annual average deficit throughout the whole period. This deficit increased dramatically from an annual average £E 25.1 million

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[21] Some of these polices are explained below in the section on foreign exchange regimes.

during the period 1952-56 to £E 1197.5 million over the 1981-86 period. The current account disequilibrium was, to a considerable extent, a reflection of the persistent and increasing deficit on trade account. The latter increased from £E 64.1 million in 1952 to £E 3325.3 million in 1986.

The increasing deficit on the trade balance was reflected in the ratio of coverage between exports and imports, which declined sharply from an annual average 75.8 percent to 41.1 percent over the periods 1952-56 and 1981-86, respectively. The failure to narrow this gap in Egypt like most LDCs, can be attributed to the structure of merchandise trade, where exports are often highly dominated by a single primary commodity, a substantial part of imports is taken up by intermediate and capital goods, and a fair part by essential consumer goods. Egypt's trade pattern, in fact, fits, to a large extent, into this trade structure of LDCs, as table (2.3) for exports, and table (2.4) for imports, show.

On the export side, table (2.3) shows that Egypt was heavily dependent on the exports of one crop, cotton up to the mid-1970s, and oil since then.[22] Nevertheless, the relative importance of semi-manufactured and finished commodities gradually increased since the inception of the development

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[22] Egypt's heavy dependence on exports of raw cotton can be traced back to the mid-nineteenth century (see Wilson, 1985, p.137).

Table 2.2: **Summary of Egypt's Balance of Payments (1952-86)**

Annual average of E million

Transactions	1952-1956	1957-1961	1962-1966	1967-1971	1972-1977	1978 1981	1982-1986
VISIBLE TRANSACTIONS							
Receipts	140.4	172.5	221.6	318.4	529.3	2007.5	2524.4
Payments	185.1	233.7	384.1	451.9	1154.3	4599.5	6144.0
1)Trade account: (deficit)	44.7	61.2	162.5	133.5	625.0	2592.0	3619.6
INVISIBLE TRANSACTIONS							
Receipts	79.9	89.6	141.8	80.8	348.8	2875.2	4660.3
Payments	60.3	61.2	89.2	102.2	233.8	1245.9	2238.2
2)Invisible balance:	19.6	28.4	52.6	-21.4	115.1	629.3	2422.1
3)Balance on CA: (1-2) deficit	25.1	32.8	109.9	154.9	510.0	962.7	1197.5
4)Transfers(+)	0	0	1.0	110.6	297.3	143.7	128.5
5)Balance on trns.&CA (3-4):deficit	25.1	32.8	108.9	44.3	213.7	819.0	1069.0
6)net capital inflow:	0.3	10.3	66.1	19.0	270.2	1036.5	919.0
7) CA & Capital account:	24.9	-22.5	-42.8	-25.3	56.5	217.5	-150.0
SDRs allocations	0	0	0	3.9	1.9	12.4	0
8)Overall BoP:	-24.9	-22.5	-42.8	-21.4	58.4	229.9	-150.0

Source: CBE "Economic Review", Various Issues.

Table 2.3: The Relative Importance of Egypt's Exports by Commodity: 1952-86

Annual average percentages

Periods	Fuels	Raw Cotton	Raw materials	Semi-and Manufactured goods	Others	Total
1952-56	0.6	79.5	5.7	13.1	0.4	100
1957-61	1.8	69.6	8.8	19.7	0.1	100
1962-66	7.0	56.2	6.9	23.2	0.2	100
1967-71	3.2	46.0	7.7	41.8	1.6	100
1972-76	11.9	39.6	8.8	39.7	0	100
1977-81	44.4	19.1	7.5	28.9	0	100
1982-86	63.4	13.5	5.9	17.2	0	100

Source: The National Bank of Egypt (NBE) "Economic Bulletin", various issues, and the UN "The Year Book of International Trade Statistics", various issues.

Table 2.4: **The Relative Importance of Egypt's Imports by Commodity (1952-86)**

An annual average percentage

Periods	Fuels	Raw Materials	Intermediate Goods	Capital Goods	Consumer Goods	Others	Total
1952-56	9.8	10.8	31.6	20.4	25.8	1.5	100
1957-61	10.9	11.3	29.3	23.0	25.0	0.6	100
1962-66	8.9	11.7	26.3	25.3	27.6	0.2	100
1967-71	7.1	20.5	34.7	21.2	13.3	3.2	100
1972-76	4.1	21.3	36.9	19.9	17.9	0	100
1977-81	1.2	13.2	33.2	28.7	23.7	0	100
1982-86	3.9	10.3	35.8	26.3	23.9	0	100

Source: The National Bank of Egypt(NBE) "Economic Bulletin", various issues, and the UN "The Year Book of International Trade Statistics", various issues.

process in the 1960s, but it has declined rapidly towards the. end of the sample period, as can be seen from table (2.3).[23] Such a decline in exports of manufactured goods can be attributed to a slowdown of development, and to the decrease of the quantity of exports of bleached rice as a consequence of the rise in domestic consumption, which was in turn due to the increase in population.[24] It is also to be noted that the liberalization policy (the open-door policy) has failed to bring any substantial increase in exports, as the share of exports of open-door policy projects does not exceed 0.4 percent of total merchandise exports.[25] On the contrary, this policy has led to massive increases in imports. Furthermore, Wilson (1985) has pointed out that the open-door policy has failed to attract foreign investment in export industries.[26]

On the import side, table (2.4) demonstrates that Egypt's commodity imports during the sample period have been dominated by three groups: intermediate commodities, capital goods, and consumer goods. The relative importance of intermediate goods

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[23] Semi-manufactured and finshed exports are mainly yarn, textiles, garments, bleached rice, cement, cigarettes, and books and newspapers.

[24] See CBE, 1979, pp. 240-44, and Wilson, 1984, p. 92.

[25] Shoura Council (1984). Also, for more details on the liberalization policies, see references in footnote 16.

[26] It seems that the size of Egypt's domestic market was the main attraction of such projects.

has been virtually constant over the whole period, while imports of consumer goods declined sharply during the 1967-76 period, but there have been increases in imports of consumer goods, both foodstuff, e.g. wheat, tea, sugar, and durable consumer goods since the mid-1970s.[27]

It is also to be noted that both Egypt's export and import destinations are, to a large extent, politically determined. Up to the early 1970s, the major share of exports has been directed to bilateral trade agreement areas, mainly Central Planning countries, particularly USSR. On the other hand, a substantial part of imports has come from free market countries, mainly developed Western countries.

As far as the balance on invisible transactions is concerned, table (2.2) shows that there has been a surplus throughout the whole period, with the exception of war years. Three sources have accounted for more than 90 percent of total receipts, namely: Suez Canal revenues, Egyptian workers in Arab oil countries, and tourism. The relative importance of each source has, however, been changing over the sample period, as

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[27] In addition to the rise in prices of foodstuff, there was a wide range of liberalization measures that were introduced within the open-door policy. These measures encouraged imports of various kinds of durable consumer goods. Of these measures foreign trade Law 118 of 1975, foreign exchange Law No.97 of 1976, and the own-import system are particularly important and will be considered in the next section.

can be seen from table (2.5). This table also shows the relative importance of the three main invisible export sources and merchandise exports, in total export earnings.

It is apparent that Suez Canal dues and tourism revenues were the major sources of invisible exports until 1967, as they accounted for more than 80 percent of total invisible receipts. However, the annual average contribution of the Canal declined sharply during the 1967-76 period because its closure in the period 1967-75. Meanwhile, the share of tourism revenues increased to an annual average more than 65 percent in the 1967-71 period. This, in fact, was due to the absence of the Canal dues rather than to an increase in tourism revenues. In addition workers' remittances were not yet a significant source of foreign exchange.

As oil prices rose in 1973 the Arab oil countries demand for skilled and semi-skilled Egyptian labour increased. In order to benefit from this, the government easied emigration procedures by abolishing exit visas in 1974. Therefore, the number of emigrants and inflow of their remittances accelerated to account for an average annual more than 50 percent of total invisible receipts during the last ten years of the sample period, 1977-86, see table (2.5).

Table 2.5: **The relative Importance of the Leading Sources of Export Earnings in Egypt (1952-86)**

An annual average percentages

Periods	Main Service Account Receipts			% of total Export Earnings	
	(1)	(2)	(3)	[(1)+(2)+(3)]	Merchandise
1952-56	36.9	7.2	45.4	32.5	63.7
1957-61	47.5	6.1	33.4	29.7	65.6
1962-66	54.2	5.5	32.1	35.9	60.9
1967-71	11.6	16.0	65.7	18.9	79.7
1972-76	8.9	40.2	47.9	38.5	60.7
1977-81	15.0	54.8	23.6	54.9	41.1
1982-86	14.7	50.5	20.4	55.5	35.5

Total export earnings includes both exports of goods and services.
(1) Suez Canal dues.
(2) Worker's remittances.
(3) Tourism revenues.
Source: CBE Economic reveiw, Various issues.

Furthermore, it has been argued that workers' remittances have replaced cotton as a leading source of Egypt's foreign exchange (Ikram, 1980). Increases in these remittances have considerably enhanced the relative importance of receipts from services in Egypt's total foreign exchange earnings, as can be seen from table (2.5). The three leading sectors of exports of services have accounted for an annual average of more than 55 percent of total export earnings in the 1977-86 period. In contrast, the share of merchandise exports, which are dominated by oil exports since 1977, declined sharply to an annual average 35.5 percent of total export earnings over the 1982-86 period, see table (2.5).

Accordingly, it is very noticeable that Egypt has four leading sources of foreign exchange, which are: workers' remittances, oil exports, Suez Canal, and tourism. However, there is a great deal of uncertainty relating to the future of these sources, as they are, to a large extent, determined externally.[28] Workers' remittances are not expected to grow by the same pattern as occurred in the 1970s. A number of migrants will be sent home, as the host oil countries have reached their absorptive capacity limits, but real income in oil Arab countries is likely to continue to grow. Thus, one

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[28] Dervis, Martin, and Van Wijnbergen (1984) have considered workers' remittances, oil exports, Suez Canal dues, and net inflows of foreign capital as " exogenous resources ". This is mainly due to their being externally determined, as we mentioned above.

should expect that workers' remittances in real terms will grow moderately and at a gradually slower rate.[29] Oil revenues are expected to decline. Apart from the uncertainty relating to the oil price, there is uncertainty about the production and the exhaustible reserves of oil and natural gas. Furthermore, employing an intertemporal model to the derivation of shadow prices of real exchange rate, accounting rate of interest, and of natural gas, Martin and Van Wijnbergen (1986) have forecasted declining oil revenues over the present decade (1990s). They also argued that a downward shift in oil prices, similar to that which occurred in 1984 and 1985, produces immediate negative income effects, but a positive income effect from the mid-1990s, especially when Egypt will be a net oil importer. In addition, the lower oil prices also produce an increasing but gradual depreciation, which will increase import substitutes which will lead to lower level of external debt, and hence a reduction in balance of payments disequilibrium.

These very optimistic forecasts in the economy are based on an optimal growth model suggesting a transfer from relying on exogenous resources to domestically generated resources from both production of tradeables and non-tradeables. However, there are two issues in connection with the model assumptions

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[29] It was predicted in 1984 that workers' remittances in real terms would grow by about 2 to 4 percent per annum in the 1980s, to a likely 1 to 2 percent after the 1990 (Ibid,p.16).

that must be raised. First is the assumption that factors of production are intersectorally mobile. In theory the effect of this assumption is that relative prices have to change to bring about substantial resource reallocations, which might not take place in the short-run. Second is the assumption that the prices of Egypt's exports are determined by export volume. This assumption is very questionable, as we shall see in chapter (4). With regard to the Suez Canal, the possibility of any growth in the Canal revenues is related to the size of world trade rather than to the increase in tariffs.

On the payments side, interest on foreign loans and other dividends, which increased sharply in the 1970s onwards, accounted for the highest share in the total of payments for service transactions. There are also other payments which are not classified. Thus, the balance on trade account plus balance on services account constitute the balance on current account, which has been in deficit throughout the sample period, except for 1954.[30]

As far as the capital account is concerned, table (2.1) shows that there has been an annual average net capital inflow over the sample period. However, since the early 1970s foreign

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[30] According to the CBE statistics, there was a surplus of £E 3.7 million in balance on current account in 1954.

capital inflows increased dramatically due to massive commitments of foreign loans rather than to foreign investment, which was thought to be attracted by the open-door economic policy. It is apparent that net foreign loan inflows have been used to finance the massive deficit in the current account, of which a substantial part was financed by assistance from Arab countries in the period between 1968-1977.[31]

In addition, Egypt also made a large use of short-term banking facilities during the 1973-76 period to finance payments of imports of food grain. The repayments of this debt were more than its disbursement, and hence it created a severe foreign exchange liquidity problem until assistance from the Gulf Organization for Development of Egypt (GODE) cleared it in 1977. Thereafter, however, this type of foreign loans was severely reduced (see Ikram, 1980, p.548). The alternative was to obtain medium and long-term loans from international institutions, such as IMF and the World Bank, or from commercial banks, but with a creditworthiness certificate from the IMF, especially after the external debt crises in the mid-1970s. Further to these attempts of financing the payments deficit, Egypt has devalued the pound either directly or

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[31] Since then Arab assistance to Egypt has declined drastically due to political reasons. For more details on Arab assistance and financing current account deficit,see Ikram, 1980,pp.350-52.

indirectly to achieve a viable payments position as recommended by the Fund and the World Bank. Thus, it is necessary to examine the exchange rate system, to which we turn.

2.5 EXCHANGE RATE REGIMES

It is apparent that Egypt has adopted an official pegged exchange rate system over the study period. This rate, however, has been supplemented by a series of other policies including controls and partial devaluation of the pound in relation to the par value. As far as these supplementary policies are concerned, the main features of Egypt's exchange rate system can be identified with three periods.

Firstly, there was increasing government intervention in the foreign exchange market during the period 1952-61. In this period certain measures were taken, mainly to face the deficit on current account. These measures started in 1952 with an extension of import licensing to imports from all countries, limiting imports from Sterling Areas on essential goods, and increases in import duties on non-essential goods. In 1953, an import entitlement system was introduced, under which Egyptian exporters were entitled to obtain licenses; these entitlements were transferable and could be sold on various premiums, subject to currency transaction, to Egyptian importers. Taken together measures had achieved an average depreciation of 5 to 6 percent for both exports and imports in the period 1952-55.[32]

The import entitlement system was abolished in September 1955. In the meantime the export tax on cotton was reduced and a general import duty of 7 % was imposed on all imports, except for the imports of raw materials and machinery equipments. Furthermore, there were attempts to link imports to export performance through import licenses. The implementation of these policies was disrupted by the Suez crisis in 1956. Egypt's trade then shifted towards Eastern European Countries and the Soviet Union.

With the introduction of planning in 1957, a system of foreign exchange budgets was established. Global and group quotas were fixed for imports on the base of the past export performance. Also, a system of import duties and export premia was introduced. The latter was amended in 1959.[33] However,

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[32] For more details on foreign exchange policies and various premia, see Hansen and Nashashibi, 1975.

[33] On the import side, the import surcharge was increased from 7 to 9 percent, and an import fee of 10 % was imposed on all imports from convertible currencies in February 1957, and were doubled by June. With regard to export premia, these were related to the Egyptian pound, and were applied to current transactions which were grouped into categories as follows:

a) A premium of 27.5 % on imports of goods and services, except for certain capital goods and raw materials.

trade with Eastern European countries was not subjected to premia either on imports or on exports.

By 1960, as the balance of payments improved all premia were reduced gradually until the premium on all exports reached 10 percent in July. In contrast, the 9 percent import surcharge was extended to imports from bilateral trade agreement countries. The ad valorem tax of 1 percent on all imports was raised to 5 percent. There emerged a multiple exchange rate that existed through application of a system of various premiums on imports and exports. This system was mainly used to stabilize cotton prices, and more broadly for the purpose of adjusting the current account.

Secondly, in the period 1961-73 there was both unified and multiple exchange rates. Following the balance of payments crisis in 1961, as discussed above, there was an attempt to unify the exchange rate through the introduction of a unified premium of 20 percent on par value, applied to both exports and imports. This unification, however, was confirmed by a

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b) Exports of cotton,textiles, and onions were to receive variable premia, which averaged between 25 and 30 % in December 1959.

c) Exports of manufactured products, except textiles and cement, were to receive a premium of 17.5 %.

d) Exports of rice and cement were sold at the official 6exchange rate, and sometimes carried an export tax.

devaluation of 25 percent in 1962.[34] Foreign exchange allocations were continued through an administrative foreign exchange budget system, and transactions were made at the unified official exchange rate up to 1973.

However, the increasing deficit in balance of payments after the 1967 war led to the introduction of multiple exchange rates in 1968 in order to achieve external balance.[35] A premium of 35 percent was introduced to attract remittances of Egyptian workers abroad. In 1971 the premium was extended to tourism, and was raised to 50 and 58 percent in May and in March 1973, respectively.[36] Also, an own-import system was developed outside the banking system. These policies were accompanied by the floating of major currencies in 1972-73, during which the U.S. dollar was devalued. As a result the Egyptian pound appreciated to £E 0.39 per dollar.

Thirdly, with the introduction of liberalization policies, the multiple exchange rate system was extended through the

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[34] The devaluation was a condition of the loan that Egypt received from the IMF in May 1962. The pound was devalued from £E 0.35088 to £E 0.43478 per dollar. The new rate was applied to all transactions, except Suez Canal charges and salaries of missions abroad.

[35] On the other hand, Scobie (1983, p. 50) argues that multiple official rates were used to control the foreign exchange smuggling that had emerged as the unified exchange rate became overvalued.

[36] Institute of National Planning (INP) (1980, p.57).

creation of the parallel market for foreign exchange, in order to encourage remittances of workers abroad. Under this market the commercial banks could buy and sell convertible currencies at an incentive or premium exchange rate. This rate was to be the official exchange rate, that fixed by the Central Bank, plus a premium of 50 and 55 percent in buying and selling operations, respectively.[37] The parallel market was enlarged through permitting the parallel market rate for a new list of 72 commodities. Other commodities were moved to this

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[37] The resources of the parallel market would be as follows: (INP,1980),

1) Savings and remittances of Egyptian workers abroad.
2) Tourism receipts, whether from individuals or groups.
3) Receipts of exports of goods, except the traditional exports, which are: raw cotton, rice, onions, garlic, potatoes, cotton yarn, textiles, crude petroleum and petroleum products, and foreign goods which are to be re-exported.
4) Remittances of Arab nations for purposes other than investment.
5) 50 percent of excess over the annual export target as determined by the foreign exchange budget for cotton yarn and textiles.

The disbursements of the parallel market were devoted mainly to the private sector as follows:

1) Invisible payments by individuals an private sector as well as travel allowances.
2) Imports of private sector of production requirements, machinery, and spare parts.
3) Imports of both private and public tourism sectors.
4) Imports of production of requirements which represent bottlenecks in producing exports that were included in the resources of the parallel foreign exchange market.

market.[38] In addition the premium was raised gradually from 50 percent to reach 79 percent of the official rate by the end of 1978.[39]

In addition to the official and parallel foreign exchange markets, a third market was created, for own-exchange imports. This was established in 1974 within the parallel market for foreign exchange. Unlike the own-exchange import system of 1968, transactions were to be made through the banking system. In accordance with the open-door policy, transactions of own-exchange imports were enlarged by issuing the Import-Export Law no.118 of 1975. Under this law individuals and private

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[38] In accordance with the IMF program of adjustment, by 1977 a number of transactions previously exported and imported at the official rate were moved to the parallel market:

1) Imports of seven essential commodities, namely wheat and wheat flour, food oils, sugar, tea, fertilizers, and insecticides. Also imports of oil products.
2) Exports of raw cotton,rice, petroleum and its products.
3) Invisible payments for Egyptian diplomatic and educational missions abroad, and insurance and freight cost of commodities imported at the official exchange rate.
4) Suez Canal charges and SUMED Pipeline dues.

[39] The exchange rates fixed by the Central Bank, £E per dollar, have been as follows:

	Official rate	The parallel rate	Premium
September 1973	0.39	0.59	50 %
February 1975	0.39	0.64	65 %
May 1976	0.39	0.67	74 %
December 1976	0.39	0.70	79 %

companies were allowed to import virtually all consumer durable and non-durable goods, raw materials, investment commodities, and machinery equipments. Moreover, licensing for imports valued less than £E 5000 was not required.

In 1976, the Foreign Exchange Law no. 97 was issued in order to relax monetary restrictions. Under this law "natural or moral" persons other than government administration and public sector units are allowed to keep all accrued or owned foreign exchange arising from operations other than exports of goods and tourism. They can also use such currencies in foreign exchange transactions through the banking system (CBE, 1976, p. 37).

The consequences of such laws were very rapid increases in imports, as shown above, and a growing black market for foreign exchange outside the banking system.[40] By the end of 1978, as a result of an increasing deficit in the trade account, and in accordance with the IMF agreement of 1978, the pound was officially devalued at a unified rate, i.e. in all domestic foreign exchange markets, of £E 0.70 per dollar in January 1979. Transactions, however, were to take place through two pools of foreign exchange: the Central Bank pool,

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[40] Imports under own-exchange system increased from £E 51.8 million to £E 610 million in 1975 and 1978, respectively. While the cash remittances increased from £E 171.8 to £E 661.6 million in the same period (CBE, 1979).

which replaced the official rate, and the authorized banks foreign exchange pool, which replaced the parallel market for exchange.[41]

Transactions through own-exchange (free or black market) increased rapidly as a result of the rise in interest rates on foreign exchange deposits and allowing consumer durable goods to be sold domestically against foreign currency, mainly U.S. dollar. Consequently the exchange rate in this market depreciated sharply, as shown in figure 2.7. This may explain the sharp increase in domestic prices relative to the world price.

In order to suppress the demand for foreign exchange some ministerial decrees were issued in 1980 through 1982.[42]

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[41] The Central Bank pool was to contain export receipts of raw cotton, rice, petroleum and its products, Suez Canal dues, and SUMED Pipeline revenues. Payments through this pool were to include imports of essential commodities: wheat and flour, sugar, tea, edible oil, fertilizers, insecticides, and their freight costs and payments of external public debt and other visible and invisible payments. Authorized banks pool was to include all visible and invisible transactions other than that in the Central Bank pool (CBE, 1979).

[42] For example Decree no.15 of 1980 provided that deposits should be paid in advance in foreign currencies to commercial banks at issuing letter of credits for imports. These deposits to be remained with the Central Bank for three months without interest rates, with the exception of Law 43 enterprises, free zones, and free city of Port Said enterprises. The deposits were 100 % for consumer durables, 40 % for raw materials and intermediate goods, and 25 % for foodstuff. This decree was amended by decrees no.242 and no.29 of 1981 and 1982 respectively.

However, the commercial banks were unable to provide the foreign exchange requirements. Consequently, in 1983 a premium rate was applied to most transactions included in the commercial banks' pool, in addition to the official rate in this pool. Such a premium was to be fixed on a flexible basis. However, in view of the sharp increase in the current account deficit in 1984, the exchange rate policy had to be reconsidered.

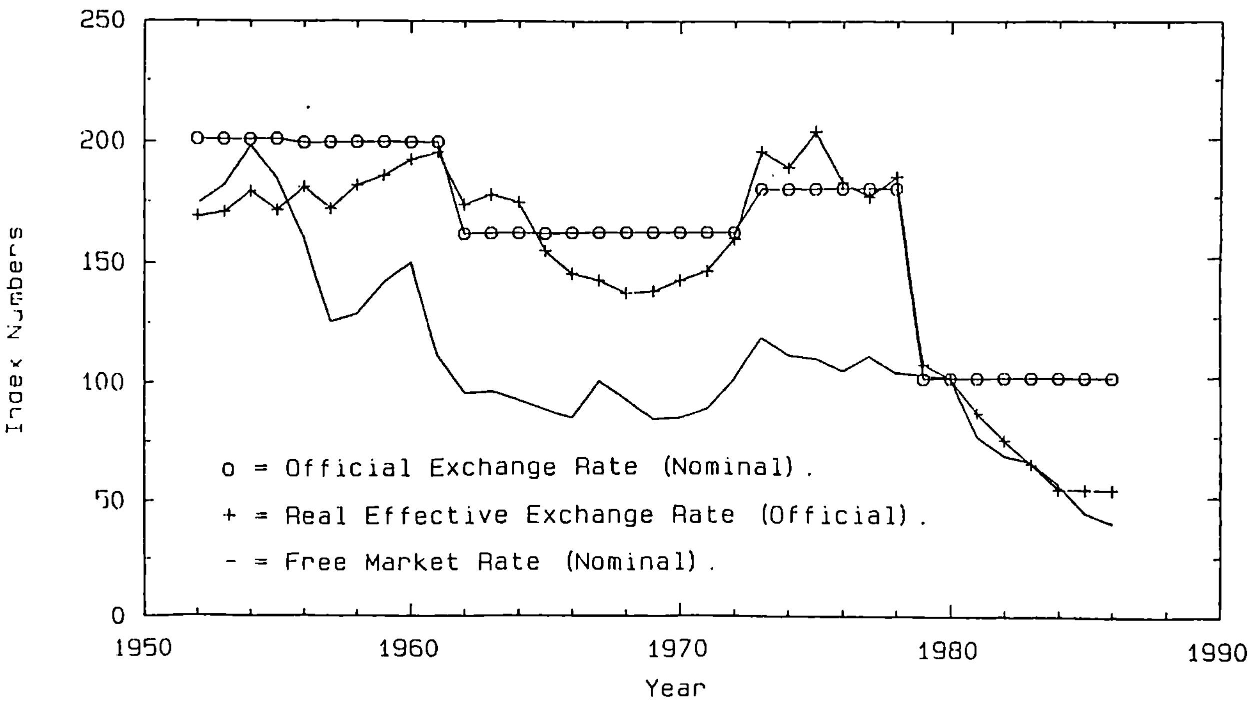

Figure 2.7: Exchange Rate Indices, in terms of US dollar per unit of Egyptian pound.

Therefore, in order to reform the exchange rate system, and to subdue the free (black) market, several decisions were taken in 1985.[43] All these decisions aimed at devaluing the

[43] For these decisions, see CBE, 1985.

overvalued pound, as always diagnosed by the IMF. Figure 2.7, in fact, shows that there has been a devaluation in the official nominal exchange rate (measured as US dollar per unit of Egyptian pound) over the sample period. However, this rate remained overvalued against both the real rate and the free market rate.[44] Nevertheless, the free market rate to which the Fund programme of 1987 devalued the Egyptian Pound to create a commercial foreign exchange market, is slightly undervalued against the real exchange rate.

To sum up, it is apparent that since the mid-1970s, Egypt has ended up with a very complicated multiple exchange rate system, which was fragmented into the following three pools:

(1) The Central Bank pool, which handles transactions mentioned above. The exchange rates in this pool were fixed in 1986 at £E 0.70 and £E 0.707 per dollar for buying and selling operations, respectively.

(2) The commercial banks pool, which includes workers' remittances, tourism receipts, exports other than these handled by the Central Bank pool, and public sector imports of capital goods. There were two exchange rates in this pool: the official rate of £E 0.84 per dollar has not been changed since August 1981, and the premium

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[44] Real exchange rate was calculated as export-import (of Egypt with her main trade partners) weighted average exchange rate (see details in appendix B).

rates were £E 1.36 and £E 1,37 per dollar for buying and selling operations, respectively, at the end of October 1986. In addition, the opening of letters of credit took place at £E 1.55 per dollar.

(3) The free market pool, which shares common sources with the commercial banks pool. It supplies funds for most visible and invisible transactions by the private sector. In May 1986, the rate in this pool ranged between £E 1.90 and £E 1.95 per dollar.

Finally, there have been some changes in the exchange rate system to unify the three pools introduced in accordance with the IMF programme in 1987 through an introduction of a commercial foreign exchange market, as will be explained in the next chapter.

2.7 CONCLUSIONS

In the post independence era, the economic performance of the Egyptian economy has been dismal. It may be hypothesized that such uneven performance, which was apparent in selected economic indictors such as current account deficit, budget deficit, and real GDP growth, was mainly due to persistent changes in macroeconomic policies, and a series of costly wars.

Despite the extraordinary increases in Egypt's foreign exchange earnings in the 1970s from oil exports, workers in the Arab oil countries, Suez Canal and tourism, the current account and the budget disequilibria reached unsustainable levels.

An examination of the Egyptian balance of payments over the sample period has revealed that the main source of deficit is in trade account. The trade deficit increased dramatically in the 1970s. It has been found that the structure of Egypt's trade is considerably similar to that of most LDCs. Whilst exports are dominated by one primary commodity (cotton up to the mid-1970s and oil thereafter), imports are dominated by substantial productive and consumer goods. This trade structure could, to a large extent, have played a significant role in accelerating the balance of payments deficit.

In addition to some assistance from Arab oil countries, Egypt has made large use of short-term borrowing from abroad to finance the balance of payments deficit. However, the inability to service such borrowings with the current account deficit continued to increase rapidly, and adjustment policies were required. Such adjustment policies were prescribed by the IMF in a series of financial-supported adjustment programmes. The main outline of the Fund adjustment programmes to Egypt are discussed in the next chapter.

CHAPTER 3

IMF APPROACH TO BALANCE OF PAYMENTS ADJUSTMENT: THEORY AND PRACTICE

3.1 INTRODUCTION

The objective of this chapter is to illustrate the macroeconomics of the IMF (The Fund) approach to balance of payments adjustment.[1] The relations between the Fund and LDCs are examined in section 3.2 within the framework of conditionality. Section 3.3 discusses the theoretical basis of the Fund approach, with criticisms provided in section 3.4. A review of some empirical outcomes of the application of the Fund financial-supported adjustment programmes in LDCs is taken up in section 3.5. Section 3.6 presents the particular IMF stabilization measures applied to Egypt. Some conclusions are presented in section 3.7

3.2 CONDITIONALITY AND LDCs

The objectives of the IMF are clearly stated in its original Articles of constitution in 1944. Article 1 states that the

[1] For a comprehensive illustration of the Fund'shistory, its institutional framework, and sources, see Bird (1984), and Killick (1984 a).

purpose of the Fund are:

(i) To promote international monetary co-operation through a permanent institution which provides the machinery of consultation and collaboration on international monetary problems.

(ii) To facilitate the expansion of balanced growth of international trade, and to contribute thereby to the promotion and maintenance of high levels of employment and real income and to the development of the productive resources of all members as primary objectives of economic policy.

(iii) To promote exchange stability, to maintain orderly exchange arrangements among members, and to avoid competitive exchange depreciation.

(iv) To assist in the establishment of a multilateral system of payments in respect of current transactions between members and in the elimination of foreign exchange restrictions which hamper the growth of world trade.

(v) To give confidence to members by making the general resources of the Fund temporarily available to them under adequate safeguards, thus providing them with the opportunity to correct maladjustments in their balance of payments without resorting to measures destructive of national or international prosperity.

(vi) In accordance with the above, to shorten the duration and lessen the degree of disequilibrium in the international balance of payments of members.

The Articles mainly present the Fund as an international institution providing financial support to members experiencing temporary balance of payments difficulties. Achievement of other tasks, particularly those related to international trade and payment restrictions, and exchange rate, is enhanced by the Fund's ability to provide finance for balance of payments purposes. The Articles also only authorise conditionality with regard to BOP and do not demonstrate any basis for other objectives, such as inflation or growth, except, as Dell (1983, p.18), and Killick (1984 a, p.185), point out, to the extent that inflation or growth contribute to BOP disequilibrium.[2]

To ensure the revolving nature of the Fund resources, the use of these is made temporary and tied to a macroeconomic programme set out in a "Letter of Intent" negotiated between state authorities and the staff of the Fund. The credit and policy guidelines are widely known as "Conditionality". The country can draw upon Fund credits if it satisfies "performance criteria" specified in the letter of intent. Thus, the main purpose of conditionality is that the Fund's financial assistance should be used to support the implementation of economic policies that give assurance that a viable payments position will be achieved within a limited period of time, which has been identified as a medium term (see Guitian,1982,p.75). The policies required to bring about this result should depend on the size and causes of the balance of payments deficits. The latter, however, are always identified by the Fund staff missions with expansionary domestic demand policies.

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[2] Guitian (1982) also mentioned that historically conditionality is used with respect to high rates of inflation and slow growth rates in industrial countries.

Any accurate assessment of the Fund's conditionality is made difficult by the confidentiality with which much of the material is treated. However, observations can be made from published material. According to the Fund practices, the main components of conditionality are:[3] 1) Preconditions, which can be found in all adjustment programmes. They are identified as policy measures that must be undertaken before the approval of the agreement of the financial credit by the Fund management. These measures are mainly related to changes in nominal exchange rate and interest rate; 2) Policies included in the letter of intent, which specifies the objectives and policies which the government will follow before and during the programme period. These policies are mainly related to different aspects of various policies, e.g. a reduction in expenditure/GNP ratio, and/or an increase in the revenue/GNP ratio, tax measures to be undertaken, and a reduction in the overall budget deficit/GNP ratio. There are also specific statements on consumer goods subsidies, on the wages of government and public sector employees, and on pricing policies of public enterprises.[4] The latter policies are very prominent in the case of Egypt; 3) Performance criteria, by which, as mentioned above, continuing access to

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[3] See Killick (1984 a), and Williamson (1982) for more details on the contents of conditionality.

[4] See Beveridge and Kelly (1980).

successive credit from the Fund is determined.[5] The Fund credit facilities are mainly committed by LDCs, although Fund credit to LDCs (non-oil) is very small relative to the deficits in their current accounts.[6] This implies that conditionality is mainly applied in LDCs.

These performance criteria include policy measures that should be adapted to achieve a viable balance of payments position. Such measures can be identified with; i) credit ceilings on total domestic credit to government and/or public sector, and to the private sector; ii) devaluation; iii) minimum levels of foreign reserves; and vi) restrictions on new external debt.

It is apparent that the Fund adjustment programme (conditionality), as described briefly above, focuses on broad aggregate demand management with particular policy instruments regarded as suitable for the control of the level of aggregate domestic demand. However, the Fund has recently been devoting increasing attention to supply-side macroeconomic variables, which influence saving and investment allocation, and hence

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[5] Fund credit is available in various tranches ranging from unconditioned to high conditioned lending. The credit facilities available at the Fund are shown in appendix A, also see Killick (1984 a), and Williamson (1982).

[6] The distribution of Fund Credits between LDCs and developed countries is presented in the appendix, table A.1. See table 1.1 in chapter 1 and table A.1 in the appendix for LDCs current account deficits and their share of Fund Credits, respectively.

affect the efficiency of the factors of production of a country. Among these policies are public sector policies on prices, taxes, exchange rates, and control of credit to the public sector to ensure that the private sector is not crowded out by the public sector (see Guitian, 1982, and Williamson, 1982).[7] However, demand management policies, i.e. monetary and fiscal restraints, are still the dominant focus of attention in Fund financial-supported adjustment programmes.[8]

Recently the Fund has moved further towards supporting supply-side policies when creating special credit facilities. In March 1986 the Structural Adjustment Facility (SAF) was established to provide assistance to low-income developing countries that are facing protracted balance of payments difficulties.[9] Furthermore, a growth objective was acknowledged, perhaps for the first time, through the establishment of the Enhanced Structural Adjustment Facility (ESAF) in December 1987, to provide additional assistance to

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[7] Khan and Knight (1982) have also referred to supply-side policies that could affect the long-run rate of growth, such as incentives for saving and capital formation, expansion of education and manpower training programmes, and stimulation of innovations. These policies, however, are not included in Fund programmes, but they are relevant to the World Bank programmes in LDCs.

[8] See Table A.2 in the appendix for a survey of the measures contained in 94 programmes in 64 countries which had undertaken these programmes in the 1980-84 period. Also see Killick (1984 a).

[9] See IMF Survey, Supplement on the Fund, September 1,1986.

low-income developing countries undertaking growth-oriented adjustment programmes.[10]

In the light of this change towards structural adjustment in Fund financial-supported programmes, a close collaboration between the Fund and the World Bank has been developed. The latter is involved in economic development via structural adjustment programmes based on the two-gap model. There are also recent attempts at merging the Fund and the World Bank approaches to adjustment process in order to constitute a growth-oriented adjustment model.[11] Thus, we turn next to an examination of the specification of the Fund model.

3.3 THE FUND APPROACH: THEORETICAL FRAMEWORK

It has been mentioned above that the main Fund objective is to finance temporary balance of payments disequilibria that are not inherently self-reversing and hence require adjustment. The formulation of policy measures included in such programmes should be based on an explicit model that links policy measures controlled by the authorities to the objective of balance of payments equilibrium. The Fund approach to balance of payments adjustment evolved in the 1950s and 1960s out of

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[10] See IMF Survey, Supplement on the Fund, September 1988.

[11] Among these recent restatements are Khan and Montiel (1989), Khan, Montiel, and Haque (1990).

staff work on problems of LDCs, particularly in Latin America. The basis of the Fund approach has been formalized principally by Polak (1957).

Commencing with the assumption of constant income velocity of money, Polak tried to bring monetary variables within the framework of national income analysis to construct a monetary model for the balance of payments. This model assumes a strong link between domestic credit expansion and a deterioration in balance of payments. The model contains four equations, of which three are identities: one is a national income identity, and two represent changes in money supply. There is only one behavioural equation, which relates imports to the level of income in the previous period via the marginal propensity to import.

With an assumption of a stable demand for money function, to be examined in chapter (6), such a model is assumed to work as changes in exogenous variables, which are the change in net domestic credit, and net exports (or as defined in the model, changes in international reserves) induces a change in money supply, which in turn leads to changes in the level of income. The latter will affect imports, and hence the balance on trade account (Polak, 1957). Considering other attempts, which have been undertaken to develop this model, the income equation can be expressed as follows:[12]

$$Y_t = Y_{t-1} + dDC_t + X_t + K_t - IM_t \qquad (3.1)$$

Y_t is the level of nominal income in the present period, which is equal to that of the previous period, Y_{t-1}, adjusted for new injections (change in domestic credit, dDC_t, exports, X_t, and net capital inflow, K_t) and leakages (imports, IM_t). The change in international reserves, dR_t, or balance of payments, is equal to net exports ($X_t - IM_t$) of goods and services plus net capital inflow. In other words, the Fund, like the orthodox monetary approach, considers the change in overall balance of payments:[13]

$$dR_t = X_t - IM_t + K_t \qquad (3.2)$$

Here dR_t, X_t, and K_t are exogenously determined. Imports are assumed to be related to national income in the present period through the marginal propensity to import, z, thus;

$$IM_t = zY_t \qquad (3.3)$$

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[12] See the papers contained in IMF (1977).

[13] For illustrations of the monetary approach to the balance of payments, see Frenkel and Johnson (1976), Johnson (1968,1972, 1977), Krueger (1984), Mundell (1968), and Mussa (1978).

Given the assumptions of constant income velocity of money and zero saving, the change in money supply, $dM^s{}_t$, equals the change in income:

$$dM^s{}_t = Y_t - Y_{t-1} \tag{3.4}$$

Combining equation (3.4) with the basic eq. (3.1), and solving for $dM^s{}_t$, we obtain,

$$dM^s{}_t = dDc_t + X_t - IM_t + K_t \tag{3.5}$$

Substituting for the definition of the change in international reserves, eq. (3.2), into eq. (3.5) yields the flow supply of money, or the balance sheet:

$$dM^s{}_t = dDC_t + dR_t \tag{3.6}$$

Taking real GDP to be exogenously determined, nominal GDP is assumed to be endogenous, thus

$$Y_t = py \tag{3.7}$$

Where y is real GDP, and p is the domestic price level, the change in the nominal GDP, dY, can be derived as:

$$dY_t = p\ dy + y_{t-1}\ dp \tag{3.8}$$

Following Khan and Montiel (1989), the demand for nominal money balances is expressed as follows:

$$dM^d_t = v\ dY = v(p\ dy + y_{t-1}\ dp) \tag{3.9}$$

Where v is the inverse of the *income velocity of money, which* is assumed to be constant, M is nominal money balances, and superscript d denotes demand. The money market is also assumed to be in flow equilibrium,

$$dM^d_t = dM^s_t \tag{3.10}$$

Substituting the flow demand for money, given by eq. (3.9), and the flow supply of money, eq. (3.6), into the equilibrium condition, i.e. eq.(3.10), and solving for the change in reserves, we obtain,

$$dR = v(p\ dy + y_{t-1}\ dp) - dDC \tag{3.11}$$

Equation (3.11) is the fundamental equation of the monetary approach to the balance of payments.[14] This equation expresses the balance of payments surplus or deficit as the difference between the flow demand for money and the flow of domestic credit. Thus, given the flow demand for money,

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[14] for the monetary approach, see references cited in footnote 13.

increases in the rate of domestic credit expansion will be exactly equalled by a deterioration in the balance of payments. This framework gives a basis for the use of credit ceilings as performance criteria in the Fund financial-supported adjustment programmes.

Equation (3.11) can be used to derive the required credit ceiling for the balance of payments target. This can simply be done by determining the desired value of dR, and then solving equation (3.11) for the required change in domestic credit. However, for the change in domestic credit to have a predictable impact on the balance of payments, the demand for money function should have a stable relationship with a number of explanatory variables. Using a more general formulation for the demand for money, and hence rejecting the earlier assumption of constant income velocity of money, would not change the analysis as long as such a function is stable.[15] This model, however, is underdetermined, as equation (3.11) contains two independent variables, i.e. dR and dp, and only one exogenous policy variable, i.e. dDC.

In order to resolve this underdeterminacy, the import equation (3.3) can be rewritten as follows:

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[15] The demand for money function and its stability in Egypt is examined in chapter (6).

$$IM = z(y_{t-1} + p\ dy + y_{t-1}\ dp) \tag{3.12}$$

Equation (3.12) is derived by substituting (Y_{t-1} + dY) for Y in eq. (3.3). Then substituting eq. (3.12) into the balance of payments identity (3.2), and solving for dR, we obtain:

$$dR_t = (X_t + K_t) - z(Y_{t-1} + p\ dy - y_{t-1}\ dp) \tag{3.13}$$

Equation (3.13) defines a second relationship between dR and dp. Exports and capital inflow, i.e. X and K, are exogenous, as mentioned above, and dp is treated as endogenous.[16] However, eq. (3.13) contains two targets, dR^* and dp^*, and only one policy instrument, i.e. dDC. Thus, the model is still one instrument short.

In an attempt to modify the Polak model, and to find a solution for the problem of two targets and one instrument, Khan et al (1990) suggest the use of the exchange rate as a policy variable, and introduce the following equation :

$$dp = a\ de + (1 - a)\ dp_d \tag{3.14}$$

Here e is the rate of exchange (units of domestic currency per a unit of foreign currency), p_d is the index of domestic

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[16] In the original Polak model nominal income, Y, is the endogenous variable.

prices, and a is the share of importables in the overall price index.[17] Thus, this introduces an additional equation for dp, an additional exogenous variable, dp_d, and more importantly, the additional policy variable, de.

Substituting for dp into equations (3.11) and (3.13), we obtain the following two modified relationships between dR and dp_d (with $p = p_{t-1} + dp$).

$$dR = v\ dy + va\ y_{t-1}\ de + v(1-a)\ y_{t-1}\ dp_d + va\ de\ dy + v(1-a)\ dp_d\ dy - dDC \tag{3.11'}$$

$$dR = (X + K) - z\ (Y_{t-1} + dy) - za\ de\ dy - z(1-a)\ dy\ dp_d - za\ de\ y_{t-1} - z(1-a)\ dp_d\ y_{t-1} \tag{3.13'}$$

The modified model is depicted in figure 3.1 to show the relationship between dR and dp_d instead of dR and dp in the original model. Equation (3.11)' is represented by a straight line MM with intercept (v dy - dDC) and a positive slope $v(1-a)\ y_{t-1}$. Equation (3.13)' is the straight line BP with intercept $(X + K - z(Y_{t-1} + dy))$ and a negative slope $- z(1- a)\ y_{t-1}$.

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[17] It is assumed that $e_{t-1} = p_{z\ t-1} = p_{d\ t-1} = 1$ under purchasing power parity, where p_z is the price of importables measured in domestic currency. Furthermore, if the law of one price holds, and p^*_z is the foreign currency price of importables, then $dp_z = p^*_z\ de = de$.

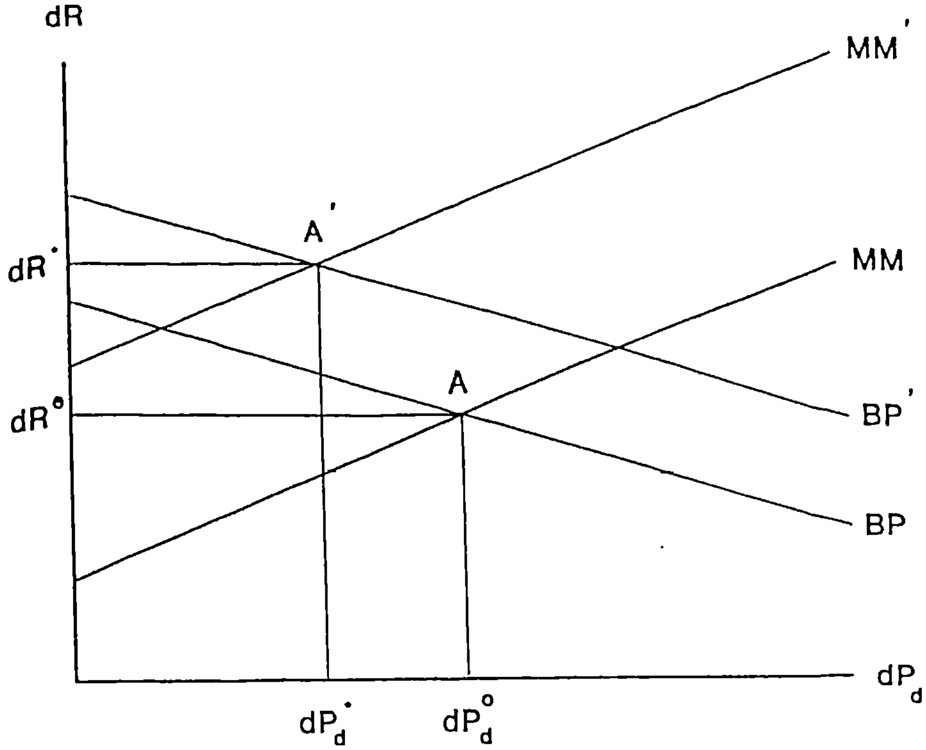

Figure 3.1: The Modified Model of the IMF Approach to BOP and Inflation

The intersection of the MM and BP loci at point A determines the equilibrium value of balance of payments (or change in international reserves), dR^{o}, and domestic prices, dp^{o}_{d}. A reduction in the rate of domestic credit expansion will shift the locus MM upwards to MM'. Consequently, an improvement in the balance of payments will be achieved, at a given domestic rate of inflation. Using the exchange rate as a policy measure will shift the BP locus, for example a devaluation shifts BP upwards to BP',and a new equilibrium level for both balance of payments and domestic inflation is achieved at point A', with targeted values of dR^{*} and dp^{*}_{d}.

The above model, however, is based on the assumption that the change in real GDP, dy, is exogenous.[18] This assumption could not be realistic, particularly in LDCs as credit contraction and devaluation will affect the level of real income adversely, as will be discussed below. Thus, the Fund has been employing an under-determined model to balance of payments adjustment in LDCs. Therefore, there are recent attempts to restate the Fund approach to include an equation of real output, even if it has to be borrowed from the World Bank, so as to make a completely specified model. These attempts, however, take the output level to be only supply determined. Given this assumption, with the contractionary policies of the Fund programme a decline in the rate of growth of output is expected.[19] Moreover, the Fund model has been described as unchanged, i.e. remained as that model developed in the 1950s (Edwards, 1989).[20] Goldstein (1989), however, does not agree with this view arguing, for example, that the Fund introduced longer and more supportive frameworks for structural and growth-oriented adjustments through the establishment of EFF in the mid-1970s and SAF and ESAF in 1985 and 1987, respectively. However, the Fund model, as explained

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[18] However,Khan and Montiel (1989) in their growth-oriented adjustment model, point out that dy is endogenous in the monetary model of the Fund adjustment programme. This is what necessitated merging of the Fund and the World Bank models, see Khan et al (1990).

[19] In the small macroeconomic model estimated in chapter 8 the real output level is not taken to be predetermined.

[20] For a critical views of the Fund model to adjustment in LDCs, see Buira (1982),Dornbusch (1982) and Edwards (1989).

above, is still emphasising demand side policies. We turn next to examine whether the Fund conditionality has been appropriate in LDCs, via some criticisms of the Fund approach, on the one hand, and reviewing some empirical outcomes of the implementation of conditionality, on the other hand.

3.4 CRITIQUES OF THE FUND APPROACH

The relevance of conditionality for correcting balance of payments disequilibria of LDCs has been a subject of controversy. Critics argue that implementing Fund adjustment policies in LDCs results in stagflationary impacts, partly because their financial markets are not well developed (Keller, 1980, and Taylor, 1981, 1988). Thus, tight credit restraint could lead to rising production costs and prices via a mark-up formula, as producers try to get credit from sources outside the banking system, i.e. from the informal sector, at higher interest rates. Tight credit conditions coincide with an increase in cost of borrowing following a rise in interest rates, which is the case in the Fund programme, in turn inducing a contraction of output on the supply as well as on the demand side.

On the demand side, devaluation operates to improve balance of payments, in a way which either increases domestic prices of exports and imports and/or reduce the foreign currency prices of exports. Devaluation also might switch domestic demand to import substitutes. Therefore, its expenditure switching role in adjustment programmes is to switch foreign demand to exports and domestic demand to nontradeables, and hence increase exports, and reduce imports. The responses to these price changes, however, depend on the price elasticities of demand for and supply of exports and imports, which will be examined for Egypt in the next chapter.[21]

Devaluation, however, is a controversial policy instrument in LDCs, in that it may exert contractionary effects on output and employment through various channels.[22] The net effect of a devaluation could be contractionary because it redistributes income from wages (labour) to profits and rents (capital) since owners of capital have lower marginal propensity to spend than wage receivers. This change in income shares will reduce aggregate demand, and hence output and employment (see Diaz-Alejandro, 1963, 1965, Cooper, 1971 a, b, and Taylor, 1988).

Devaluation, on the demand side, can be deflationary rather

[21] For theoretical analysts of conditions under which devaluation, in a framework of relative price elasticities, can improve the trade balance of developing countries, see Brown (1942), Harberger (1950), Polak (1952), Robinson (1947), and Williamson (1983).

[22] See Lizondo and Montiel (1989) for a comprehensive analytical overview of the literature on contractionary devaluation in developing countries.

than expansionary in a developing aid-receiver country as it raises the domestic prices of imports, which are mainly price inelastic goods, i.e. capital and investment goods, and intermediate commodities. Expenditure on domestic commodities, therefore, tends to decline, especially if it is coupled with wage indexation, and thereby reduces domestic output and employment (see Cooper 1971 b, and Islam, 1984).[23]

On the supply side, devaluation may increase the profitability of exporting by improving the terms of trade of tradeables relative to non-tradeables, and provide exporters with more domestic currency per unit of foreign currency, and hence stimulate production of exports. This Fund supply-side approach to devaluation was first set out by Nashashibi (1980) with reference to Sudan. The idea is to calculate the "competitiveness" of each export by relating its international value added to the cost of domestic inputs used in its production. An export is considered unprofitable if this ratio is less than the devaluation in exchange rate. Thus, devaluation is seen as making activities profitable. However, the profitability of exporting relies heavily on the responses of export prices, import prices, domestic prices, i.e. elasticities of demand and supply of exports and imports, to

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[23] For less pessimistic empirical evidence of the effects of devaluation on income, expenditure, and the current account, see Gylfason and Schmid (1983), Gylfason and Risager (1984), and Gylfason and Radetzki (1985).

devaluation.

The empirical evidence of calculating the profitability of long and medium staple cotton, groundnut, sesame, and gum arabic does not lend any support to such an approach to devaluation as applied to Sudan (see Ali, 1985, Hussain and Thirlwall, 1984, and Saad and Simpson, 1990).[24]

McKinnon (1979, p. 448) has pointed out that devaluation, as the Fund adjustment policy, is **"simply a precondition for the restoration of the country's normal access to foreign capital: it is not meant to improve the trade balance as traditional theory has it".**[25] Furthermore, such improved access to external capital is more likely to increase than to decrease imports as credit is directed to expenditure on imports.

Fund adjustment programmes have been severely criticized for placing too much emphasis on domestic expansionary demand policies as the main source of balance of payments difficulties in LDCs, even after the post-1973 period. Some empirical evidence, however, suggests that many LDCs have been

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[24] In a detailed study on IMF conditionality and devaluation, empirical evidence from Sudan, Jamaica, and Zaire do not support either the demand-side or the supply-side approach to devaluation (Hussain, 1983).

[25] Similarly the acceptance of the Fund conditionality is described as a " certification " of borrowers (Eckaus, 1982), or a "seal of approval" to external borrowing (Manual Pastor, Jr., 1987).

faced with severe payments problems caused by external factors rather than by domestic mismanagement (Dell and Lawrence, 1980, Dell, 1981, 1983). Moreover, an IMF staff study's finding is that the single most important variable determining current account imbalances in 32 non-oil developing countries in the period 1973-80 is the deterioration in terms of trade (Khan and Knight, 1983, p. 835). Foreign real interest rates and the rate of growth of industrial countries were also found to have significant influences upon the current account of the developing countries considered. The same study, however, also finds that domestic policy variables, particularly the real effective exchange rate and the budget deficit/GDP ratio are significant.

Similarly, Helleiner (1986) does not deny the responsibility of domestic policies of the developing countries for some of their balance of payments difficulties. Nonetheless, the relative importance of external and domestic factor influences upon balance of payments varies greatly from one country to another. He has examined the impact of both external shocks and domestic policy measures upon balance of payments of 25 developing countries individually over three periods, 1973-75, 1973-78, and 1978-82. His results in the case of Egypt have shown that external shocks, which are terms of trade deterioration and deceleration of world trade, have contributed more than domestic policies to Egypt's current account difficulties over the period 1973-75 and 1973-78. In contrast, during the 1978-82 period domestic policies have been the main source of current account deficit. Such improvement in the external factors, especially terms of trade, can be mainly attributed to the second rise in the oil prices in 1979-81, as Egypt became a net oil exporter in 1977.[26]

Additionally, an examination of the determinants of the current account of Egypt over a longer period, 1964-84 shows that two external factors, namely the foreign interest rate and the slowdown of growth rate in industrial countries, have significantly contributed to the current account deficit. To a lesser extent the real effective exchange rate adversely affected the current account position.[27]

The Fund approach to BOP adjustment has been labelled as "Monetary".[28] This is because of the inclusion of domestic credit ceilings in its adjustment programmes.[29] In fact, the Fund's focus on credit ceilings as an expression of a monetary

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[26] Similar results on the effects of external shocks on Egypt's BOP, among other countries, over the periods 1974-76 and 1979-81 have been found by Balassa (1984, pp. 58-59).

[27] see Hemaya (1986).

[28] See IMF (1977).

[29] See Killick (1984 a), and Table A.2 in the appendix.

approach to BOP was not due originally to a fundamental analysis of BOP difficulties in LDCs, but rather to data shortages, and the simplicity of such an approach.[30] However, this data shortage explanation cannot provide a long-run basis for focusing on domestic credit ceilings.

The monetary approach to BOP itself has also been subjected to several criticisms. First, apart from the simplicity of the monetary approach, it concentrates on steady-state equilibrium, which may not be appropriate for sustained disequilibria. Second, some of the assumptions upon which the theory is based are very strong and sometimes highly unrealistic, such as the stability of demand for and supply of money functions in the long-run, full employment, and the passivity of domestic credit policy. Some of these assumptions, especially the stability of the demand for money function, are empirically supported in LDCs.[31] On the other hand, the supply of money has been found to be a complicated matter and empirical evidence indicates that the money multiplier may not in practice have the stability assumed by the monetary approach.[32] Moreover, it has been pointed out

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[30] IMF (1977, p. 7).

[31] For a survey of evidence, see Coats and Khatkhate (1980). For the stability of the demand for money in Egypt, see chapter 6.

[32] See Coats and Khatkhate (ibid). The money supply function for Egypt is examined in chapter 5.

that the Fund approach has considerable elements of eclecticism and does not pursue a purely monetary approach (Killick, 1984, and Williamson, 1980).

According to the preceding discussion of both the Fund approach and some of its criticisms, it is to be expected that the application of Fund adjustment policies would induce reductions in output growth and capital formation.[33] To cosider if this turned out to be the case, we turn next to a review of some empirical outcomes of the implementation of the Fund programmes in LDCs.

3.5 AN EVALUATION OF FUND ADJUSTMENT POLICIES IN LDCs: AN EMPIRICAL FRAMEWORK

It was demonstrated earlier that Fund adjustment programmes are predominantly directed towards improving the BOP. However, as the Fund approach to stabilization developed, other targets to that of the BOP are considered, such as reducing inflation, in the modern version of the IMF model, as shown above in figure 3.1. There is also a more recent target of raising the growth rate of output. The question which may be raised here is whether the Fund programmes have been

[33] In fact most of the above criticisms of the fund perspective of the BOP problems in LDCs reflect the structuralist critique of the Fund policies. For more details on the structuralist perspective, see Bacha, 1987, Crockett, 1982, Diaz-Alejandro, 1981, Foxley, 1983, and Taylor, 1981.

effective in achieving the broad macroeconomic objectives for which they were formulated. Cross-country studies of the effects of Fund Stand-byes and EFF have been undertaken by Fund staff, and non-Fund staff.[34] There are also studies of the impacts of Fund adjustment policies for individual countries.[35]

In assessing the impact of Fund adjustment programmes in LDCs, we may follow Guitian (1982, p. 99). Three methods can be identified: First, the before-after method, in which actual macroeconomic performance under, or after the programme can be compared with performance prior to the programme. Second, the actual-versus target method, which is to compare actual macroeconomic performance under the programme with targets specified. Third, the control-group method, which compares actual macroeconomic performance in countries with Fund programmes with performance in a control group of non-programme countries.[36] Khan (1988) has referred to a fourth methodology, which is the comparison of simulations. This method relies on simulation of econometric models to infer the

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[34] For a comprehensive survey of the effects of the Fund programmes, see Khan (1988).

[35] There are 18 individual country studies undertaken by WIDER, and summarized by Taylor (1988). See also Cline and Weintraub (1981), Killick (1984 b), and Williamson (1983).

[36] This method is identified by Guitian as comparing the achievements under the programme with that which would have occurred in the absence of such a programme.

hypothetical performance of the Fund policy packages and alternative set of packages.[37] We can also add a fifth method, which examines the relationship between specific policy instruments, e.g. domestic credit expansion, and BOP or inflation.

Following these methodologies, the main task here is to review some of the effects of Fund adjustment programmes on some key variables in LDCs, as follows:

(1) <u>The before-after method</u>

Employing the before-after method, Reichmann and Stillson (1978) examined a total of 79 upper tranche Stand-bys implemented during the period 1963-72. They reported an improvement in the overall BOP in 64 percent of the 75 programmes examined, but this was statistically significant in only 24 percent of the cases. On the other hand, they failed to find any significant relationship between before and after growth performance. With regard to inflation, they found that of 29 programmes, the rate of inflation fell in 6 of 11 programmes in which there was a significant deceleration in the rate of domestic credit expansion. In 9 programmes which included a devaluation, there was a significant acceleration

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[37] There are a few studies which follow this method, e.g. Khan and Knight (1981,1982,1985).

in inflation in 5. In the remaining 16 programmes there was no significant change in the rate of inflation.

Connors (1979) examined 31 programmes implemented over the 1973-77 period. He compared macroeconomic targets one year before and after the inception of programmes. Connors (1979) has concluded that Fund programmes apparently had no noticeable influences on growth, inflation, the current account deficit, or the ratio of fiscal deficit to GNP.[38]

Following the same before-after approach, but for three years periods, Kelly (1982) examined the relation between fiscal variables and macroeconomic performance in 77 programmes during the 1971-80 period. Kelly reported that the fiscal deficit declined in 56 percent of programmes, and that the current account and fiscal deficits fell in 62 percent of cases examined. However, there was a decline in the average growth rate in about 50 percent of the cases, and an increase or no change in the other half.

Killick (1984 a) has also employed the before-after methodology for both one and two years periods to assess the effect of 38 programmes, agreed with non-oil developing countries during the period 1974-79, on these variables: GDP growth rate, inflation rate, current account, changes in

[38] Connors'(1979) conclusion is taken from Khan (1988), and Killick (1984).

international reserves, and changes in domestic credit and money supply. Killick concluded that the programmes had no significant effects on the current account and the overall balance of payments deficits. There was a small positive effect on growth rate, and the rate of inflation increased as a consequence of the programmes.

(2) Actual-versus target method

Following the second method, Reichmann (1978) compared actual outcomes for growth, inflation, and balance of payments with that specified in 21 programmes, which were adopted over the 1973-75 period, in 18 countries. The results showed that for overall balance of payments, the number of cases that were on target was equal to those that were above or below targets. Inflation targets were exceeded in the majority of cases, but growth targets came to close to being met in 62 percent of cases.

Zulu and Nsouli (1985) studied 35 programmes adopted by African countries during 1980-81. By comparing the achievements with the targets, they found that economic growth was below target in most countries, inflation targets were achieved in most countries, and current account targets were attained in about half of the countries. Zulu and Nsouli (1985) also employed the before-after method to examine the effects of programmes in their 35 cases. Their results indicate a decline in growth in most countries, a worsening of inflation in over half of the countries, and no significant change with regard to the current account and the overall balance of payments.[39]

(3) <u>The control-group method</u>

The control-group methodology was employed by Donovan (1981,1982) to examine programme effects in a number of programmes implemented in the 1970s.[40] He compared macroeconomic performance in programme countries with that for non-programme countries (control group). The control group contains all non-oil developing countries, and the comparisons were undertaken over one-year and three-year pre- and post-programme. Results showed a relative improvement for programme countries in the ratio of the overall balance of payments, and the current account deficits to GDP, and in inflation during both time periods. In contrast, the growth rate of programme countries was less than that of all non-oil

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[39] Zulu and Nsouli (1985) also compared changes in the policy indicators using the two methodologies. Similarly, Beveridge and Kelly (1980) compared the actual policy indicators with targets associated with fiscal contents in 105 programmes during the 1969-78 period.

[40] The first study concentrates on the effects of devaluation in 12 upper-tranche programme during the period 1970-76. The second study covers 78 upper-tranche stand-by programmes over the 1971-80 period for current account, 84 programmes for overall BOP, and 73 programmes for inflation.

developing countries over the one-year period. Despite some improvement in the long-run, i.e. three-year period, the growth performance of programme countries remained less than that of non-programme countries.[41]

Employing the control group method, Gylfason (1987) found a substantial improvement in the overall BOP and current account of the stand-by programme countries over the 1977-79 period. In contrast, using the same method for a sample of 68 programmes adopted during the 1974-81 period, Goldstein and Montiel (1986) found that programme countries demonstrated higher inflation, larger current account and overall BOP deficits, and slower growth than non-programme countries in the pre-programme period. Adjusting for these differences in performance and taking into consideration the effects of policy measures on targets, they used regression analysis to estimate the programme effects. The results do not show any favorable outcomes for BOP, inflation and growth.

From the empirical evidence reviewed above, it is very difficult to conclude that Fund adjustment programmes have been successful. There may have been some decline in current account deficit and the rate of inflation, but the effect on output has been rather ambiguous, i.e. either output declined

[41] Donovan (1982,pp.187-195) examined programme effects on other key macroeconomic variables, e.g. changes in savings, investment, real consumption.

or remained unchanged. Furthermore, apart from the likely sample selection bias in cross-section studies, these studies do not reveal a single country behavioural equation, but they describe different behaviours, reflecting different country characteristics. Moreover, Harberger (1987) points out that nonparametric tests and comparisons are preferable when doing cross-country studies.

The above approaches of estimating programme effects themselves include a degree of bias. For example, the before-after approach is biased because it attributes all changes in macroeconomic performance between the pre-after-and programme periods to programme policy measures, ignoring any other external or supply shocks during the programme period. The problem with the control-group approach is that programme countries are not randomly selected, and they can differ systematicaly from non-programme countries. The implication is that the programme effects measured under the control-group will be biased (see, Goldstein and Montiel, 1986).[42] Therefore, these methods are poor estimators of the counterfactual or the macroeconomic performance that would take place in the absence of a programme.

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[42] For more critical views on these approaches, see Goldstein and Montiel (1986) and Khan (1988).

(4) The simulation method

Applying the simulation approach, Khan and Knight (1981) constructed a dynamic macroeconometric model which was estimated using pooled data for 29 developing countries, most of which implemented a Fund programme. They then simulated the hypothetical effects of adjustment programmes which aimed at improving the external payments position using policies that included domestic credit ceilings and reductions in government expenditure. Their simulation results showed that restraint of domestic credit can have undesirable effects on output, employment, and factor incomes, particularly in the short-run. Furthermore, they admitted the difficulty of estimating such a model for a single developing country, because of the unavailability of data.[43]

Khan and Knight (1985) extended their simulation analysis to include a comparison between two policy packages: one is a typical set of demand management policies (i.e. a once-for-all reduction in the rate of domestic credit expansion, and government expenditure, plus devaluation). The second is a combined package of demand-management policies plus a set of structural policies that would gradually improve productive capacity.[44] They compared the results for the balance of

[43] Khan and Knight (1981,p. 42).

[44] The results of this study are taken from Khan (1988).

payments, inflation, and real output growth. According to their simulations, in the short-run the demand package improved the balance of payments, but at the expense of a higher rate of inflation, and a decline in growth rate. Furthermore, it seems that Khan and Knight (1985) are not certain, according to their simulations of the combined package, that the structural policies could offset the adverse impacts of demand restraint on inflation and growth.[45] However, the long-run programmes are superior.

(5) Examining the effect of policy instruments

However, there are a number of attempts to study the relationships, which are often ignored in cross-section studies, between particular policy instruments and the balance of payments and/or other targets. For example, Aghevli and Khan (1980) examined the relationship between domestic credit and the balance of payments.[46] They constructed a dynamic macroeconometric model to determine the impact of monetary policy, in terms of changes in domestic credit, on real

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[45] Khan (1988, p.11) pointed out that **"the simulations of combined package showed that structural policies could help to offset, at least partially, any short-term effects on growth that might result from demand restraint and inflationary consequences of devaluation".**

[46] This relationship was examined also for Ghana, see Franco (1979), and Teal and Giwa (1985).

income, the price level, and the balance of payments.[47]

Their model was estimated using nonlinear two-stage least squares (2SLS) during the 1951-73 period, for eight developing countries.[48] The results, both in terms of the estimates of parameters, and the power of tracking the dependent variables historically, show that the model behaved well, in terms of statistical tests and economic reasoning. However, results of a policy simulation for a typical IMF contractionary policy confirm the adverse impact on growth rate, despite little improvement in inflation and BOP.

In another attempt to examine the appropriateness of the IMF monetary policies to Bangladesh, Parikh and Starmer (1988) estimated a typical Aghevli and Khan model for the period 1972-86. The results of 2SLS and 3SLS show that very few of the estimated parameters are statistically significant.[49]

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[47] The model consists of four stochastic equations for, real expenditure, the rate of inflation, imports, and exports. There are four identities for, the money supply, nominal income, the monetary base, and the balance of payments.This kind of model follows the Polak model (1957), and its subsequent studies to formulate the relationship between domestic credit and the BOP, e.g. Argy (1969), Fleming and Boissonncault (1961), Rhomberg (1965), Polak and Boissonncault (1960), Polak and Argy (1971), Prais (1965), also see IMF (1977).

[48] The countries are Argentina, Brazil, Colombia, Ecuador, Mexico, India, Korea, and The Philippines. The period for Ecuador and Korea was 1954-73.

[49] In fact the only equation that shows a statistically significant parameter is the import equation (2SLS).

Therefore, their conclusion casts doubt upon the sustainability of the monetarist model in the Bangladesh economy.[50] However, the poor results of the Parikh and Starmer study may be attributed to data limitations with a very short sample period (15 annual observations).

Therefore, it can be concluded that apart from the defects of cross-section studies, the relevance of such studies to an individual country is remote. Further, econometric models which were broadly constructed to assess Fund policies in LDCs are either difficult to apply to one single country or unsuccessful. Thus, any accurate evaluation of Fund policies may need a close investigation of each or some of such policies in a single country through a time series approach. Before we do that in the case of Egypt, we discuss the particular Fund stabilization measures applied to Egypt.

3.6 IMF STABILIZATION POLICIES APPLIED IN EGYPT

Since joining the IMF in 1945 as an original founding member, Egypt has signed four stabilization programmes with the Fund.

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[50] Parikh and Starmer (1988) have arrived at a similar conclusion in a study on the relation between money supply and prices in Bangladesh. For more studies on money supply, inflation and sometimes the BOP, see Aghevli and Khan (1978), Aghevli (1977), de Silva (1977). Also see chapter 7 for more studies on inflation.

These programmes were: a credit facility in May 1962, which collapsed fairly rapidly, a stand-by arrangement in April 1977, whereby Egypt was to receive SDR 125 million, an Extended Fund Facility (EFF) in June 1978, by which Egypt was to receive SDR 600 million, but this was not fully implemented. Finally, a stand- by arrangement in May 1987, whereby Egypt was to purchase up to the equivalent of SDR 250 million over the period to November 1988. All these agreements were accompanied with a package of policy measures for adjusting balance of payments disequilibrium.

Because of the confidentiality that surrounded such agreements, it has been found very difficult to obtain any official documents to enable us to know the exact policy measures specified. However, there are a few studies have been undertaken about Egypt's stabilization policy, mostly in Arabic, that will be the main source in summarizing policies of these programmes.[51] The outline of these programmes has shown an emphasis on the demand management side through three main policies, which are devaluation, monetary, and fiscal policy contractions via control of budget deficit and domestic credit expansion. Additionally, some attention was directed to the supply side of the economy in the last two programmes, mainly through structural changes related to price distortions in various sectors and the public sector.

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[51] These studies are: Abdel-Khalek (1979,1987), Hussian (1982), and IMF (1987).

Table 3.1: Summary of Stabilization Policy Measures of the Fund Financial-Supported Programmes for Egypt

Financial-Supported Programmes	Demand Management Policies	Structural Changes (supply-side policies)
May 1962 Stand-by Arrangement	1.devaluation of 25 %. 2.monetary policies to reduce growth rate of domestic credit. a)raising interest rate from 3 % to 5 %. b)raising reserve ratio.	
March,1977 Stand-by Arrangement	1.devaluation. 2.ceilings on domestic credits. 3.curbing short-term external debt. 4. monetary and fiscal policies such as raising interest rate and cutting subsidies.	
June,1978 EFF	1.devaluation 2.liberalizing trade and payments. 3. curbing budget and external debt. 4.raising interest rates. 5.restricting bank credits.	1.rationalizing public sector prices. 2.encouraging agricultural sector 3. changing public employment policy
May,1987 Stand-by Arrangement	1.a reduction in budget deficit via expenditure restraint and revenue measures. 2.controlling inflation via monetary measures, i.e.cutting the rate of domestic credit creation and raising interest rate	1.unification of the exchange rate via introduction of market rates. 2.encouraging agricultural sector via price policies 3.an increase in domestic energy prices to world levels over time.

Therefore, an attempt is made in table 3.1, above, to summarize the main policy measures specified in each programme, dividing these measures into that related to demand management and supply oriented policies.

Generally, the basic feature of the above stabilization packages are similar to those concluded between the IMF and other developing countries, as shown earlier in this chapter, with slight variations reflecting the specificity of the Egyptian economy, particularly in areas such as subsidies and the dominant role of the public sector.

It is also to be noted that the structural adjustment policies are directed mainly towards correcting price distortions rather than to policies of directing investment to specific sectors.

In an attempt to determine the effects of the main adjustment measures of the above programmes, Abdel-Khalek (1987) argues, in a structuralist approach, against the consistency and the effectiveness of both demand -management and structural adjustment policies. For example, the Fund stresses devaluation and import liberalization, which operate in opposite directions, as a means to correcting the balance of payments. Also, structural adjustment policies, mainly in terms of correcting domestic price distortions, such as raising interest rate, domestic energy prices, and import liberalization, were described by Abdel-Khalek (1987) as very unfavourable to the manufacturing sector. This is due to the problem that policies such as raising interest rates and energy prices may discourage long-term investment in the manufacturing sector. Therefore, Abdel-Khalek labels the IMF Package to Egypt as one which **" led to a process of de-industrialization".**[52] Where the de-industrialization may be taken to mean less contribution by the industrial sector in GDP.

Abdel-Khalek's argument, in fact, is correct according to his analysis of the change in the contribution of the manufacturing and service sectors in total GDP, and their share in total investment. However, he does not present any formal test to show how Fund policies have been ineffective, relying instead on descriptive changes in macroeconomic variables before and after the programmes. Following this method, it is difficult to detect any improvement in macroeconomic performance in Egypt. Apart from some improvement in both annual averages of current account deficit and real growth rate of GDP during and after the implementation of the 1977 stand-by followed by the 1978 EFF, the rate of inflation increased. These improvements in the current account deficit and growth, however, are to be

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[52] Abdel-Khalek Ibid, p. 19.

attributed to other external shocks rather than to the application of Fund policies.[53]

Further, in the case of devaluation, Abdel-Khalek based his arguments on the structuralist discussion of devaluation in LDCs. To show the effect of devaluation on exports and imports, he used a very crude method, i.e. changes in the ratio of exports and imports to GNP instead of testing the elasticities of demand for and supply of exports and imports. Therefore, the present study could be the first in the case of Egypt to concentrate on key empirical relationships within the IMF model in order to provide a small macromodel, as will be shown in the remaining chapters.

3.7 CONCLUSIONS

The main objective of this chapter has been to illustrate various aspects of IMF financial-supported adjustment programmes in LDCS. In view of the preceding discussion one may conclude that conditionality, which accompanies the Fund financial-supported programmes to countries experiencing a fundamental BOP disequilibrium, is a standard package of policies that must be undertaken by a country to achieve a

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[53] These external shocks were increases in the oil prices, and in workers' remittances. The higher growth of GDP was mainly due to enormous constructions followed the 1973 war, see the previous chapter for more details, and table 2.1 for changes in the main economic indicators.

viable payments position. This IMF adjustment package concentrates on demand-side policies, and hence ignores any other external shocks to the country BOP. This policy package has also been based on an incomplete model.

From a survey of the main outcomes of the implementation of IMF policies in LDCs, there is no conclusive empirical evidence that contractionary aggregate demand polices have been generally successful in LDCs. There may be some improvement in payments position and deceleration in prices in some countries, but there have also been some reductions in output growth, which will adversely affect the BOP and inflation in the long-run in some countries.

However, the methods used in evaluating the IMF adjustment policies in LDCs are not reliable, as they compare the actual and the counterfactual targets. Assuming other things are not equal, this may not be valid. Moreover, testing the relevance of the main hypotheses of the Fund approach in an individual country context has been largely neglected. Therefore, the present study intends to fill this gap in the case of Egypt, starting by examining foreign trade, both exports and imports, in the next chapter.

CHAPTER 4

DETERMINANTS OF FOREIGN TRADE IN EGYPT

4.1 INTRODUCTION

The demand for imports in developing countries has generally been assumed to be relatively inelastic with respect to price. LDCs, also, are assumed to have a low income elasticity of demand for their exports, and the volume of these exports to be largely determined by the demand side.[1] Consequently, developing countries may only marginally benefit from any growth in the world income or devaluation of their currencies. Therefore, the latter, which is one of the main measures included in the Fund adjustment programme, might not represent a viable tool towards increasing export earnings and reducing import payments, and hence alleviating any balance of payments disequilibria in these countries. Although, demand for LDCs' exports as a whole might be price inelastic, demand for one country's exports might be elastic.

The empirical evidence of Khan (1974), however, does not fully support these assumptions, as the price elasticity of demand for developing countries' exports is found to be on average

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[1] For a discussion of these assumptions, see for example studies by Chenery and Strout (1966), and Maizels (1968). Also for the patterns in LDCs, see McCarthy, Taylor, and Talati (1987).

significantly different from zero and close to unity, but above unity for only four out of fifteen developing countries. The same study reports a price elasticity of demand for imports higher than unity in eleven countries. These results may imply that LDCs neither have a price inelastic demand for imports of goods nor do they face a world price inelastic demand for their exports. Consequently, the Marshall-Lerner condition whereby the sum of price elasticities of demand for imports and exports exceeds unity would be satisfied, and hence a devaluation could improve the trade balance. However, this condition might be necessary, but is not sufficient because any improvements in the trade balance depend on the elasticities of both demand and supply of exports and imports. Furthermore, such a result might not be generalized to any individual developing country, but an examination of the demand for and supply of exports and imports of one country may reveal different findings.

As illustrated earlier, in chapter (2), the structure of Egypt's foreign trade, both exports and imports, seems to fit typically into LDCs foreign trade pattern. The objective of this chapter, therefore, is to examine the determinants of Egypt's exports and imports performance during the sample period, 1952-86. This is to be approached through an estimation of the demand and supply functions of exports and imports in order to show the effects of changes in relative prices. The rest of this chapter is to be organized as follows: Section 4.2 provides an overview of the literature on the foreign trade, both exports and imports. The demand and supply functions of exports are specified in section 4.3. Section 4.4 presents a theoretical outline of the demand and supply functions of imports. Empirical results of estimation of export and import equations are reported in section 4.5. Concluding remarks are given in section 4.6

4.2 EXPORT AND IMPORT FUNCTIONS: AN OVERVIEW

Until recently, empirical studies of international trade flows have been formulated and estimated on the basis of a single equation model. This approach assumes that export and import supply price elasticities are infinite , or at least large (Houthakker and Magee, 1969, Gafar, 1981, Goldstein and Khan, 1976, Bahmani-Oskooee, 1984, 1986, and Tegene, 1989 a).[2]

Goldstein and Khan (1978) have argued that the assumption of infinite supply elasticities may be acceptable for the world supply of imports to a single small country, but is not so for the supply of exports. Under normal circumstances, it is implausible to assume that an increase in the demand for a country's exports can be met without an increase in the price of its exports, unless the country has idle production capacity in the export sector or the production in this sector follows constant or increasing returns to scale.

[2] For a comprehensive survey on price and income elasticities in foreign trade, see Magee (1975), and more recently Goldstein and Khan (1985).

To solve this problem a simultaneous equation model has been applied, mainly to developed countries.[3] This approach has recently been extended to developing countries, where Khan (1974) has applied a simultaneous equation model to exports and imports in fifteen LDCs. Arize (1987, 1988) presents empirical results using the simultaneous equation approach in eight African countries.[4] Balassa et al (1989) have applied the simultaneous model to the export supply and demand of two developing countries (Greece and Korea). Applications of this approach for an individual country includes Ng'eno (1989) on Kenya's exports, Reidel (1988) on Hong Kong's manufactured exports, and Bond (1985) on exports of oil-exporting countries.

Most of these studies have, generally, employed traditional functions of exports and imports. In the export equation, for example, the quantity of exports is related mainly to two explanatory variables, namely: the level of world real income, and relative export prices, i.e. the ratio of export prices to world prices. This type of equation has been criticised for not permitting a separation to be made between cyclical and secular income effects on international trade flows. In this regard, Khan and Ross (1975, p. 357) have argued that including current real income as an explanatory

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[3] See for example studies by Browne' (1982), Dunlevy (1980), Goldstein and Khan (1978) on eight developed countries, and Haynes and Stone (1983 a).

[4] Arize (1989) applied the same approach to export of seven Asian Countries.

variable in the import demand equation would not only lead to misleading estimates of the income elasticity, but may also result in estimation of a misspecified equation. This misspecification would be of the omitted variable type.

Magee (1975, pp.188-93, 211-14) also provides a persuasive rationale for separating the effects of cyclical and secular factors on the level of international trade flows, arguing that trade flows respond differently to secular and business cycle income changes and the regression estimates with income in level form, i.e. GNP as the only variable of income, mix these effects. Thus, in an attempt to separate the secular and business cycle effects on international trade flows, a number of empirical studies, mainly applied to developed countries, decompose income into trend, and deviation from trend, and in some instances, the change in the deviation from trend (see e.g. studies by Ball, Eaton and Stemer, 1966, Khan and Ross, 1975, Dunlevy, 1980, Haynes and Stone, 1983 a, b).

Recently, Arize (1987, 1988) has included the income trend and the deviation from trend in equations of international trade flows for eight African developing countries. His empirical results have shown significant cyclical and secular effects on trade flows in some countries. One may ask, however, whether Egypt has an identifiable business cycle. In fact, generally, Egypt may not have a clear income business cycle, and hence the effect of income cycle on its imports would be remote. However, it could be argued that the demand for Egypt's exports might be affected by the business cycle in importing markets, which are mainly industrial developed countries. Therefore, secular and cyclical income effects on Egypt's trade flows will be examined.

Regarding the price variable, it is postulated in most empirical studies that trade flows respond symmetrically to changes in domestic and foreign prices. According to this assumption the price elasticity has been estimated in terms of relative prices of exports and imports, i.e. px/wp and pm/pd, respectively.

On the other hand, there is empirical evidence which shows that trade flows do not respond symmetrically to domestic and foreign prices (see Marry and Ginman 1976, Wilson and Takacs, 1979, Haynes and Stone, 1983 a,b, and Arize, 1987, 1988).

It is also assumed in most empirical studies that the response of trade flows to changes in the exchange rate would in general resemble that to changes in foreign trade prices. In other words, variations in exchange rate would affect trade flows through changes in relative prices, and hence exchange rates were not included in most international trade equations. This assumption, however, may not be correct since Orcutt (1950, pp.541-42) argues that trade flows may respond differently to small and temporary changes in prices than to large and fairly permanent changes, such as that produced by a devaluation.

The empirical evidence on small and large price changes, however, seems inconclusive. Junz and Rhomberg (1973) using a pooled sample of 13 industrial countries, concluded that the response to exchange rate changes is very similar to that of price changes measured in local currency. Also, Goldstein and Khan (1976) found no evidence to support Orcutt's arguments. Both studies, however, have some defects: the first used market share change not trade flows as a dependent variable, and the second did not test exchange rate effects directly.

On the other hand, empirical evidence from estimating price and exchange rate response patterns in both developed and developing countries found that the total response time was shorter on exchange rates and the latter impact on trade flows appears to be greater than that of price changes (see e.g. studies by Wilson and Takacs, 1979, on six developed countries, and Bahmani-Oskooee, 1984 and 1986, on South Africa and on seven developing countries, respectively.

As discussed in chapter (2), the exchange rate of the Egyptian pound was pegged to the U.S. dollar and was constant over most of the study period. Since the dollar was floated against the other major currencies, the effective exchange rate facing Egypt must have fluctuated affecting trade flows. Therefore, the exchange rate along with relative prices may affect trade flows.[5]

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[5] Nominal effective exchange rate was incorporated in the estimated equations, but its coefficient was not significant. Therefore, this variable was dropped.

In an attempt to identify the most satisfactory (in terms of econometric performance) equations for trade flows in Egypt, four specifications of export and import functions, incorporating the above arguments about the prices and income variables, are employed, as will be seen below.

4.3 EXPORT EQUATIONS

4.3.1 Demand Equations

The traditional demand for exports function is specified in log-linear form, which relates the quantity of exports to real world income and relative export prices. From the preceding arguments, the long-run export demand equation is expressed in the following four specifications:

$$\ln X^d = a_o + a_1 \ln TWY_t + a_2 \ln CWY_t + a_3 \ln px_t + a_4 \ln wp_t + u1_t \qquad (4.1)$$

$$\ln X^d = b_o + b_1 \ln TWY_t + b_2 \ln CWY_t + b_3 \ln(px/wp)_t + u2_t \qquad (4.2)$$

$$\ln X^d = c_o + c_1 \ln YW_t + c_2 \ln px_t + c_3 \ln wp_t + u3_t \qquad (4.3)$$

$$\ln X^d = d_o + d_1 \ln YW_t + d_2 \ln(px/wp)_t + u4_t \qquad (4.4)$$

Where,

X_t = volume of exports index, and superscript d denotes demand.

YW = world real income (measured by OECD real GDP index, 1980 = 100).

px = export price in terms of U.S. dollars (export unit value index, 1980 = 100).

wp = world price level in U.S. dollars (OECD wholesale price index, 1980 = 100).

TWY= trend of world real GDP index,1980 = 100.

CWY= deviation from trend index, 1980 = 100

$u_{1,..,4}$ = stochastic disturbance terms.

The traditional demand for exports equation (4.4) was estimated in log-linear form for a number of developing countries by Houthakker and Magee (1969).[6] The coefficients d_1 and d_2 are income and relative price elasticities, respectively. d_1 is expected to be positive, because growth in the world income increases the demand for exports of Egypt. d_2 is expected to be negative, as an increase in export prices reduces the demand for exports. It is, also, to be noted that OECD prices (WPI), in U.S. dollars, is used as a proxy for the world price level, wp.

If equation (4.4) is correctly specified, then in equation (4.3), where px and wp are included separately, we expect to have;

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[6] This equation was also estimated by Khan (1974) for exports and imports in 15 developing countries, and for demand for imports in 12 developed countries by Goldstein and Khan (1976). Also for a survey on empirical studies on exports and imports, see Goldstein and Khan (1985).

$$c_3 = -c_2 \quad \text{or } c_2 + c_3 = 0 \tag{4.5}$$

For the correct specification of equation (4.4), the linear restriction in equation (4.5) will be tested.[7]

In the more general equations, (4.1) and (4.2) the world income term is separated into two variables: income trend, TWY, which is calculated by regressing the log of real GDP on linear and quadratic time trends. The deviation from trend, CWY, is then the difference between real GDP and its trend. The former is assumed to capture income secular effects on export demand and the latter captures the business cycle effects. The coefficients of these two variables are both expected to be positive.[8]

In the short-run the quantity of exports does not adjust instantaneously to changes in income or prices. Thus, Khan (1974) has argued that equilibrium equations, such as (4.1) - (4.4), are subject to incorrect specification due to the estimation of an equilibrium relationship when the actual relationship entails disequilibrium. In order to overcome

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[7] Khan (1974) has argued that in the case of LDCs another misspecification in equation (4.4), as quantitative restrictions placed by importing countries are not taken into account. However, there is no available measure for these restrictions.

[8] The income trend and the deviation from trend terms were originally tested for developed countries, see e.g. Dunlevy (1980), Haynes and Stone (1983 a, b). Recently, these terms have been tested for eight African countries in two studies by Arize (1987, 1988). The first study is concerned with the demand for and supply of exports, and the second with exports and imports.

this problem, it is assumed that the volume of exports adjusts to the desired level of exports according to a partial adjustment mechanism:

$$\ln X_t - \ln X_{t-1} = A\,(\ln X^d_t - \ln X_{t-1}) \quad ; A > 0 \qquad (4.6)$$

The adjustment mechanism, eq.(4.6), states that the change in the exports in the present period depends on the difference between the long-run quantity of exports demanded in the present period and the actual exports in the previous period, where A is the adjustment coefficient.

Substituting equations (4.1) through (4.4) into equation (4.6), and solving for X_t, the following four reduced form equations are obtained:

$$\begin{aligned}\ln X_t = {} & Aa_o + Aa_1 \ln TWY_t + Aa_2 \ln CWY_t + Aa_3 \ln px_t + \\ & Aa_4 \ln wp_t + (1-A) \ln X_{t-1} + Au1_t \end{aligned} \qquad (4.7)$$

$$\begin{aligned}\ln X_t = {} & Ab_o + Ab_1 \ln TWY_t + Ab_2 \ln CWY_t + \\ & Ab_3 \ln(px/wp)_t + (1-A) \ln X_{t-1} + Au2_t \end{aligned} \qquad (4.8)$$

$$\begin{aligned}\ln X_t = {} & Ac_o + Ac_1 \ln YW_t + Ac_2 \ln px_t + Ac_3 \ln wp_t + \\ & + (1-A) \ln X_{t-1} + Au3_t \end{aligned} \qquad (4.9)$$

$$\begin{aligned}\ln X_t = {} & Ad_o + Ad_2 \ln YW_t + Ad_2 \ln(px/wp)_t + \\ & (1-A) \ln X_{t-1} + Au4_t \end{aligned} \qquad (4.10)$$

Equations (4.7) - (4.10) represent versions of a disequilibrium model. However, both equilibrium and disequilibrium models are still subject to simultaneous equation bias, and hence, OLS estimation will give biased estimates. Therefore, in order to allow for the simultaneous relationship between quantity and prices of exports, a supply function for exports is specified in the next subsection, and a use of two-stage least squares will give unbiased and consistent estimates.

4.3.2 SUPPLY EQUATIONS

The supply of aggregate exports is specified as a log-linear function of the price of exports, domestic price level, and domestic real income (see Arize, 1988, Ali, 1984, Haynes and Stone, 1983b, and Khan, 1974.[9] Considering also the income secular and cyclical effects, the long-run export supply function can be written in the following four alternative forms:[10]

$$\ln X^s_t = a_o + a_1 \ln px_t + a_2 \ln pd_t + a_3 \ln TY_t + a_4 \ln CY_t + w1_t \quad (4.11)$$

$$\ln X^s_t = a_o + a_1 \ln(px/pd)_t + a_2 \ln TY_t + a_3 \ln CY_t + w2_t \quad (4.12)$$

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[9] Browne' (1980) and Goldstein and Khan (1978) included relative price terms only.

[10] See the arguments above on the use of the secular and cyclical income variables.

$$\ln X^s_t = a_0 + a_1 \ln px_t + a_2 \ln pd_t + a_3 \ln Y_t + w3_t \quad (4.13)$$

$$\ln X^s_t = a_0 + a_1 \ln(px/pd)_t + a_2 \ln Y_t + w4_t \quad (4.14)$$

Where:

X^s_t = quantity of export supply,and subscript s denotes supply.

pd = domestic prices in terms of U.S. dollars (measured by the wholesale price index, WPI, 1980 = 100).

Y = domestic real income (real GNP index, 1980=100).

TY = capacity (the trend of domestic real income, GNP).

CY = capacity utilization (the deviation of income from trend).

w1,..,w4 = stochastic disturbance terms.

The above four export quantity-supply equations can be estimated either as an equilibrium model, or as a disequilibrium model. The coefficients on Y, TY, and CY are expected to be positive, as a high capacity level and utilization permit an increase in the quantity supplied. Since this model assumes that the country is a price-setter for its export prices, the rise in export prices should stimulate the supply of exports,and hence the coefficient on px is to be positive, and that on pd is expcted to be negative.

Following Goldstein and Khan (1978), outside the equilibrium relationship the price of exports is assumed to adjust to excess supply, as follows:

$$\ln px_t - \ln px_{t-1} = D\ (\ln X_t - \ln X^s{}_t) \qquad (4.15)$$

Here X_t is the actual exports. The adjustment mechanism in equation (4.15) implies that the exporting country is not a price taker, but a price setter. Thus, substituting equations (4.11) through (4.14) into equation (4.15) and solving for px_t the following two reduced form equations are obtained:[11]

$$\ln px_t = A_o + A_1 \ln X_t + A_2 \ln pd_t + A_3 \ln TY_t + A_4 \ln CY_t + A_5 \ln px_{t-1} \qquad (4.16)$$

$$\ln px_t = B_o + B_1 \ln X_t + B_2 \ln pd_t + B_3 \ln Y_t + B_4 \ln px_{t-1} \qquad (4.17)$$

Where:

$$A_o = \frac{Da_o}{1+Da_1}; \quad A_1 = \frac{D}{1+Da_1}; \quad A_2 = \frac{Da_2}{1+Da_1};$$

$$A_3 = \frac{Da_3}{1+Da_1}; \quad A_4 = \frac{Da_4}{1+Da_1}; \text{ and } \quad A_5 = \frac{1}{1+Da_1}.$$

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[11] The reduced form equations derived form (4.11) and (4.12), as well as from equations (4.13) and (4.14) are the same.

And;

$$B_o = \frac{Da_o}{1+Da_1}; \qquad B_1 = \frac{D}{1+Da_1}; \qquad B_2 = \frac{Da_1}{1+Da_1};$$

$$B_3 = \frac{Da_2}{1+Da_1} \text{ and } B_4 = \frac{1}{1+Da_1}.$$

In theory there is a positive relation between prices and quantity supplied, thus the coefficient on X_t is expected to be positive. The coefficients on Y, or TY and CY are expected to be negative, as increases in capacity lead to a decline in production costs, which in turn push the price downward. The expected parameter on Pd is positive, as the rise in domestic prices leads to an increase in export prices.

In comparing the two specifications of the export supply function: supply-quantity and supply-price, empirical support for the supply-price equation in the literature is found. Based on quarterly data from eight industrial countries, Goldstein and Khan (1978) have indicated that inferior results are obtained from a supply-quantity equation. As a consequence,they have suggested that the supply side of the export market may have a more monopolistic market structure than the demand side, and that exporters are price- setters rather than price-takers.

Haynes and Stone (1983 b) also have provided a comparison between the supply-quantity and the supply-price estimates that was based on testing the sign and significance of the coefficients on the current and lagged variables of prices, quantities, and the wholesale prices. They used the criteria that in a dynamic model, if a supply-quantity equation is to be more appropriate, the coefficients on both current and lagged export prices should be positive and that on domestic prices should be negative. Similarly, if a supply-price equation is more appropriate, the coefficients on both present and lagged quantities, X_t, should be positive, and that on domestic prices, pd_t, should be positive. Consistent evidence was found in support of the dynamic supply-price specification for the aggregate U.K. and U.S. trade flows.

However, one may ask if this is the case in small open economies, such as those of LDCs. In order to provide an answer to that question, alternative specifications which may be appropriate for small open economies are shown in the next subsection.

4.3.3 EXPORT QUANTITY AND PRICE ADJUSTMENT IN A SMALL OPEN ECONOMY

Browne (1982) has argued that the adjustment mechanisms of equations (4.6), in which the quantity of exports adjusts to the excess demand, and (4.15), in which the price of exports adjusts to the excess supply, are not appropriate for small open economies.[12] Alternatively, an adjustment mechanism for

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[12] Such adjustment mechanisms assume that the exporting country is a price setter. However, the fact is that most LDCs are price takers.

export quantity and prices in a small open economy are specified as follows:

$$\ln X_t - \ln X_{t-1} = A' \ (\ln X^s_t - \ln X_{t-1}) \tag{4.18}$$

$$\ln px_t - \ln px_{t-1} = B' \ (\ln X^d_t - \ln X_t) \tag{4.19}$$

Equation (4.18) indicates that export quantities adjust toward suppliers' desired values, i.e. exporting countries adjust their actual quantity of exports according to supply conditions. On the other hand, according to equation (4.19) export prices adjust in line with excess demand, i.e. the exporting country is a price-taker.

Substituting equations (4.11) through (4.14) into equation (4.18), and solving for X_t, we obtain the following four reduced form equations for the quantity of exports:

$$\ln X_t = A'a_0 + A'a_1 \ln px_t + A'a_2 \ln pd_t + A'a_3 \ln TY_t + A'a_4 \ln CY_t + (1-A') \ln X_{t-1} \tag{4.20}$$

$$\ln X_t = A'a_0 + A'a_1 \ln(px/pd)_t + A'a_2 \ln TY_t + A'a_3 \ln CY_t + (1- A') \ln X_{t-1} \tag{4.21}$$

$$\ln X_t = A'a_0 + Aa_1 \ln px_t + A'a_2 \ln pd_t + A'a_3 \ln Y_t + (1-A') \ln X_{t-1} \tag{4.22}$$

$$\ln X_t = A'a_0 + A'a_1 \ln(px/pd)_t + A'a_2 \ln Y_t + (1- A') \ln X_{t-1} \tag{4.23}$$

If equations (4.20) - (4.23) are appropriate, Browne (1982) suggests a low value for the estimated coefficient on px or px/pd because the nontraded sector of the economy is small relative to the total economy. Hence, a change in export prices will not elicit a large supply response because of the relative unavailability of factors of production from the non-traded sector.

Similarly, substituting equations (4.1) through (4.4) into equation (4.19), and solving for px_t, we obtain:[13]

$$\begin{aligned} \ln px_t = {} & D_o + D_1 \ln X_t + D_2 \ln TWY_t + D_3 \ln CWY_t + \\ & D_4 \ln wp_t + D_5 \ln \ln px_{t-1} \end{aligned} \tag{4.24}$$

$$\begin{aligned} \ln px_t = {} & E_o + E_1 \ln X_t + E_2 \ln YW_t + E_3 \ln wp_t + \\ & E_4 \ln px_{t-1} \end{aligned} \tag{4.25}$$

Where:

$$D_o = \frac{B`a_o}{1-B`a_3}; \qquad D_1 = \frac{-\ B`}{1-B`a_3}; \qquad D_2 = \frac{B`a_1}{1-B`a_3};$$

$$D_3 = \frac{B`a_2}{1-B`a_3}; \qquad D_4 = \frac{B`a_3}{1-B`a3}; \text{ and } D_5 = \frac{1}{1-B`a_3};$$

[13] It is to be noted that the reduced form equations derived from eqs. (4.1) and (4.2), as well as from eqs. (4.3) and (4.4) are the same.

And;

$$E_o = \frac{B'd_o}{1-B'd_2}; \qquad E_1 = \frac{-\,B'}{1-B'd_2}; \qquad E_2 = \frac{B'd_1}{1-B'd_2};$$

$$E_3 = \frac{B'd_2}{1-B'd_2}; \text{ and } \quad E_4 = \frac{1}{1-B'd_2};$$

If equations (4.24) and (4.25) are more appropriate, Browne (1982) suggests that the absolute value of the ratio of estimated parameter of lnwp to that of lnX should be large. This implies that a small open economy is a perfect competitor in the world market, hence it has no long-term monopoly power in international trade.

The expected signs are $D_1 < 0$, $D_2 > 0$, $D_3 > 0$, $D_4 < 0$, $D_5 > 0$. Similarly, coefficients on TWY and CWY are expected to be negative. It is to be noted that Faini, Clavijo,and Abdel Senhadji-Semlali (1988) have employed an equation similar to equation (4.24) to test for the validity of the small country hypothesis. The small country hypothesis indicates that the demand for exports is infinitely elastic. If this hypothesis is correct, then px is fully determined by world prices.

4.4 IMPORT EQUATIONS

4.4.1 DEMAND EQUATIONS

The conventional form of import demand function relates the quantity of imports demanded by a country to relative import prices, and the level of real income in that country.[14] As in formulating the export equation, three modifications are to be introduced into the traditional import demand function.[15] Thus, the import demand equation is expressed in four alternative log-linear forms as follows:[16]

$$\ln IM^d_t = a_o + a_1 \ln TY_t + a_2 \ln CY_t + a_3 \ln pm_t + a_4 \ln pd_t + v1_t \tag{4.26}$$

$$\ln IM^d_t = b_o + b_1 \ln TY_t + b_2 \ln CY_t + b_3 \ln(pm/pd)_t + v2_t \tag{4.27}$$

$$\ln IM^d_t = c_o + c_1 \ln Y_t + c_2 \ln pm_t + c_3 \ln pd_t + v3_t \tag{4.28}$$

$$\ln IM^d_t = a_o + d_1 \ln Y_t + d_2 \ln(pm/pd)_t + v4_t \tag{4.29}$$

IM is the quantity of imports, subscript d denotes demand, pd is the domestic price level, in U.S. dollars (measured by WPI), pm is the import price, in U.S. dollars, and all other variables were defined earlier. The sign of the income

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[14] This form of import demand equation was estimated for both developed and developing countries, see e.g. Houthakker and Magee (1969), and Khan (1974).

[15] For these modifications, see Khan and Ross (1975).

[16] See Khan and Ross (1977) for the appropriate form of import demand equation.

coefficient is ambiguous.[17] Similarly, signs on TY and CY could be positive or negative. The import-domestic price ratio term implies a degree of substitution between foreign and domestic goods, thus the expected sign is negative, where the rise in import prices reduces the demand for imports. If equation (4.29) is correctly specified, we expect to have equal coefficients on pm and pd, but with opposite signs from equation (4.28), i.e.,

$$c_3 = - c_2 \qquad \text{or } c_2 + c_3 = 0 \tag{4.30}$$

This linear restriction, in eq. (4.30). will be tested in the same way as that for the export equation.

Considering the behaviour outside the equilibrium relationship, the actual quantity of imports is assumed to adjust to the long-run (desired) quantity of imports according to a partial adjustment mechanism:

$$\ln IM_t - \ln IM_{t-1} = B\ (\ \ln IM^d{}_t - \ln IM_{t-1})\ ,\quad B < 1 \tag{4.31}$$

Equation (4.31) relates the change in imports in the present period to the difference between the demand for imports in

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[17] The sign of coefficient on the income variable is expected to be positive, but it can be negative. The argument is that imports represent the discrepancy between consumption of importables and the domestic production of such importables. It is assumed that there is no exports of these commodities. Therefore, an increase in production could lead to a decline in imports, See Khan and Ross (1975), and Magee (1975).

that period and the actual imports in the previous period, and B is the adjustment coefficient. Thus, substituting equations (4.26) through (4.29) into equation (4.31), and solving for $lnIM_t$, we obtain the following four alternative reduced form equations:

$$lnIM_t = Ba_0 + Ba_1 \, lnTY_t + Ba_2 \, lnCY_t + Ba_3 \, ln \, pm_t + Ba_4 \, lnpd_t + (1-B) \, lnIM_{t-1} + B \, v1_t \quad (4.32)$$

$$lnIM_t = Bb_0 + Bb_1 \, lnTY_t + Bb_2 \, lnCY_t + Bb_3 \, ln(pm/pd)_t + (1-B) \, lnIM_{t-1} + B \, v2_t \quad (4.33)$$

$$lnIM_t = Bc_0 + Bc_1 \, lnY_t + Bc_2 \, lnpm_t + Bc_3 \, lnpd_t + (1-B) lnIM_{t-1} + B \, v3_t \quad (4.34)$$

$$lnIM_t = Bd_0 + Bd_1 \, lnY_t + Bd_2 \, ln(pm/pd)_t + (1-B) \, lnIM_{t-1} + Bv4_t \quad (4.35)$$

The coefficients on income and prices are taken to be the short-run or "impact" elasticities. An estimation of the above equation by OLS implies that there is some source of bias.[18] Hence, a simultaneous equation model should be considered, and a supply equation for imports is specified in the next subsection.

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[18] Three sources of bias were explained earlier in the export demand equation, for more details see Khan (1974).

4.4.2 SUPPLY EQUATIONS

The supply of imports is specified as a log-linear function of world real income, the price of imports and the world price level. To take into account the income secular and cyclical effects on the supply of imports, the real world income is separated into the real income trend and the deviation from trend.[19] Thus, the import supply function can be written in the following two alternative forms:

$$\ln IM^s_t = c'_0 + c'_1 \ln TWY_t + c'_2 \ln CWY_t + c'_3 \ln wp_t + c'_4 \ln pm_t + v1_t \quad (4.36)$$

$$\ln IM^s_t = c_0 + c_1 \ln YW_t + c_2 \ln wp_t + c_3 \ln pm_t + v2_t \quad (4.37)$$

All variables are as defined earlier,and superscript s denotes the supply of imports. The expected sign on wp is negative, as the rise in the world prices implies an increase in the cost of producing imports, which leads to a decrease in the supply of imports. The sign on pm is expected to be positive, where increases in pm enhance the supply of imports. Parameters on YW as well as TWY and CWY are expected to be positive.

As above, a disequilibrium in import supply can be specified by a partial adjustment mechanism, in which the change in

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[19] See Haynes and Stone (1983 a, b) for secular and cyclical effects.

import supply in the present period is related to the difference between the desired level of imports in that period and the actual supply of imports in the previous period:

$$\ln IM_t - \ln IM_{t-1} = K\,(\ln IM^s_t - \ln IM_{t-1}) \quad , K > 0 \tag{4.38}$$

Substituting each of the two equations of import supply, i.e.(4.36) and (4.37), into equation (4.38), and solving for lM_t, we obtain:

$$\ln IM_t = Kc'_o + Kc'_1 \ln TWY_t + Kc'_2 \ln CWY_t + Kc'_3 \ln wp_t + Kc'_4 \ln pm_t + (1-K) \ln IM_{t-1} \tag{4.39}$$

$$\ln IM_t = Kc_o + Kc_1 \ln YW_t + Kc_2 \ln wp_t + Kc_3 \ln pm_t + (1-K) \ln IM_{t-1} \tag{4.40}$$

Since $c_1 > 0$, $c_2 < 0$, $c_3 > 0$, and $K > 0$, and the expected signs of coefficients in (4.39) are $Kc'_1 > 0$, $Kc'_2 < 0$,$Kc'_3 > 0$, $Kc'_4 < 0$, and $(1-k) > 0$. Coefficients on TWY and CWY are predicted to be positive.

The dynamic model of equations (4.39) and (4.40) is based on the assumption that import suppliers are price takers. This assumption,however, might not be plausible in the case of developing countries' imports, as these countries are import price takers because a significant part of their imports, as shown for example in the case of Egypt in chapter 2, is taken up by essential commodities: both consumer and investment goods. Thus, following Khan (1974), to take into account the assumption that LDCs are also import price takers, the import prices are taken to adjust to excess supply, as follows:[20]

$$\ln pm_t - \ln pm_{t-1} = K' \left(\ln IM^s_t - \ln IM_t \right) , \quad K' > 0 \qquad (4.41)$$

Substituting equations (4.36) and (4.37), respectively, into equation (4.41), and solving for pm_t, we obtain:

$$\ln pm_t = A_o + A_1 \ln TWY_t + A_2 \ln CWY_t + A_3 \ln wp_t + A_4 \ln IM_t + A_5 \ln pm_{t-1} \qquad (4.42)$$

$$\ln pm_t = B_o + B_1 \ln YW_t + B_2 \ln wp_t + B_4 \ln IM_t + B_4 \ln pm_{t-1} \qquad (4.43)$$

Where:

$$A_o = \frac{K'c'_o}{1-K'c'_4}, \qquad A_1 = \frac{K'c'_1}{1-K'c'_4}, \qquad A_2 = \frac{K'c'_2}{1-K'c'_4},$$

$$A_3 = \frac{K'c'_3}{1-K'c'_4}, \qquad A_4 = \frac{K'c'_5}{1-K'c'_4}, \text{ and } \qquad A_5 = \frac{1}{1-K'c'_4}.$$

And;

$$B_o = \frac{K'c_o}{1-K'c_3}, \qquad B_1 = \frac{K'c_1}{1-K'c_3}, \qquad B_2 = \frac{K'c_2}{1-K'c_3},$$

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[20] Haynes and Stone (1983 b, p. 628) have argued that this dynamic adjustment is related to firm behaviour. This implies that prices are assumed to respond to quantities in lagged behaviour.

$$B_3 = \frac{K'c_4}{1-K'c_3}, \quad \text{and} \quad B_4 = \frac{1}{1-K'c_3}.$$

The expected signs of the coefficients are $B_1 < 0$, $B_2 > 0$, $B_3 < 0$, and $B_4 > 0$. Also, in eq. (4.42) coefficients on TWY and CWY will be negative, as increases in both capacity and capacity utilization reduce the cost of production and price of imports. We turn next to estimating demand and sypply equations specified above for exports and imports.

4.5 EMPIRICAL RESULTS

As mentioned above, using OLS to estimate export or import demand equations would give biased and inconsistent estimates, specially if the supply relationship is less than infinitely price elastic, as the estimated price elasticity in the demand equation would be a weighted average of a positive supply elasticity and a negative demand elasticity (see Khan, 1974). Therefore the two-stage least squares method is used in estimating the export demand and supply equations to allow for the simultaneous relationship between the price and the quantity of exports and imports.

The Sargan two-stage least squares method (2SLS), described by Fair (1970), is employed.[21] The instruments are the

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[21] For data sources and methods of generating the variables, see Appendix B.

current values of the explanatory variables, the one-period lag of these variables, the lagged value of dependent variable, the constant term, and the dummy variable, which represents the war years of 1965 and 1976-1973. Estimates of export and import equations are presented in the next subsection. It is to be noted that the dummy variable, D_t, is included in the estimated equations below to capture the effects of wars on demand and supply of exports and imports.

4.5.1 EXPORT DEMAND

Estimates of the equilibrium and disequilibrium export demand equations as well as autocorrelation coefficients are given in tables 4.1 and 4.2.

Table 4.1: 2SLS Estimates for Demand for Exports (Equilibrium Equations: annual data,1952-86)

Dependent variable: lnX_t

Explanatory Variables	Export Equations (4.4)	(4.3)	(4.2)	(4.1)
Constant	1.531 (4.698)	1.692 (8.531)	-9.922 (3.013)	-7.242 (0.961
$lnYW_t$	0.653 (8.297)	0.280 (2.401)		
$lnTWY_t$			3.122 (4.385)	2.450 (1.335)
$lnCWY_t$			-0.207 (0.869)	-0.112 (0.325)
$lnpx/wp_t$	-0.961 (5.552)		-0.814 (6.349)	
$lnpx_t$		-1.029 (8.356)		-0.866 (4.708)
$lnwp_t$		1.358 (8.031)		0.957 (2.526)
D_t	-0.136 (2.135)	-0.009 (0.165)	-0.047 (0.929)	-0.032 0.535)
Rho	0.450	0.046	0.047	0.032
DW	1.812	1.846	1.784	1.814
R^{-2}	0.787	0.843	0.850	0.846
F-Farley	4.525	1.745	0.947	1.662
F-R	4.857			

t-values are in parentheses.

F-Farley is the stability test employed by Farley, et al (1970, 1975),in which the coefficients thought to be unstable are treated as a linear function of time. Since we do not know which coefficients were unstable,each coefficient was considered as unstable,except the dummy variable,d, and F-Farley test was estimated as follows:

F-Farley(v1,v2)= [(RSS2 - RSS1)/v1]/(RSS1/v2), where RSS1 and RSS2 are residuals sum of squares of the unrestricted and restricted equation,respectively, v1 is number of restrictions,v2 is the degrees of freedom which equal N-k, where N is the number of observations and k is the number of coefficients in the unrestricted equation. F-R is the F test for the linear restriction of the validity of expressing the export prices in the form of equation (1), and also using income level rather than the income trend and the deviation from income. In the two cases the computed F values are significant at 5 percent level.

Table 4.2: 2SLS Estimates of Export Demand Equation (Disequilibrium Equations: annual data,1952-86)

Dependent Variable: $\ln X_t$

Explanatory Variables	Export Equations			
	(4.10)	(4.9)	(4.8)	(4.7)
const.	1.571 (3.012	2.752 (5.252)	-9.639 (2.982)	-4.059 (0.498)
$\ln YW_t$	0.624 (4.879)	0.093 (0.776)		
$\ln TWY_t$			2.898 (3.812)	1.464 (0.717)
$\ln CWY_t$			-0.263 (1.171)	-0.077 (0.223)
$\ln(px/wp)_t$	-0.885 (4.592)		-0.698 (4.188)	
$\ln px_t$		-0.797 (5.115)		-0.764 (3.804)
$\ln wp_t$		1.087 (5.329)		0.939 (2.443)
$\ln X_{t-1}$	0.023 (0.131)	0.355 (2.043)	0.166 (0.939)	0.217 (1.197)
D_t	-0.135 (2.063)	0.009 (0.182)	-0.036 (0.754)	-0.007 (0.129)
Rho	0.478	-0.182	-0.070	-0.122
DW	1.811	2.031	1.866	1.942
R^{-2}	0.800	0.847	0.848	0.845
F-Farley	2.810	0.724	0.987	1.352
F-R	7.070			

t-values are in parentheses.

In the equilibrium model equations (table 4.1) the estimated income elasticity is significantly different from zero at the 1 percent level, and exhibits the expected positive sign. However, including px and wp separately has resulted in a sharp decline in the income elasticity (see table 4.1

eq.(4.3)). The implication of this is that both domestic and foreign prices are more effective than the world income in determining the demand for Egypt's exports, although the income elasticity of demand for Egypt's exports is significantly different from zero at 5 percent level (see eq. (4.3) in table 4.1). However, the income elasticity in the long-run is less than unity. This implies that as world income grows, Egypt will only capture a small percentage of world exports (see Arize, 1990, p.899).

Regarding the secular and cyclical effects of income, it seems that the business cycle in the importing markets does not affect the demand for Egypt's exports. The coefficient of CWY is not significantly different from zero, and shows the wrong sign. In contrast, the income trend, TWY, has the correct sign, and is significant at the 1 percent level. Also the coefficient is very high, i.e 3.122. This may indicate that changes in the world income trends are in operation in determining the demand for Egypt's exports. However, estimates of eq.(4.1) with px, and wp separated reduced the significant level of all variables except that of px. The null hypothesis of imposing a restriction on equation (4.3) to be estimated as equation (4.4) is accepted as F-R is significant at 5 percent level. Judging, however, by the Farley test equation (4.4) is also not stable, and has a serial correlation problem as shown by Rho. This implies that the traditional export demand equation, i.e. eq. (4.4) is not appropriate, and equation (4.3) is superior in the case of

Egypt. The elasticity of relative export prices is significantly different from zero at the 1 percent level (see eqs. (4.4) and (4.2) in table 4.1. This elasticity is close to unity. This implies that devaluation could be effective in stimulating exports on the demand-side. It is apparent that the coefficients on export price and the world price are not equal. The coefficient on world price is larger than that on export price.

The highly significant price elasticity might misleadingly indicate that Egypt has been a price maker for her export prices, eapecially results in table 4.5 below indicate that Egypt is almost a price taker. Therefore, one possible interpretation for this is that up to the early 1970s most of Egypt's exports were sold under trade and payments agreements with the Eastern Bloc Countries. Another possible explanation is that there might be a data problem. However, Further work is required to substantiate these conclusions. The impacts of wars on Egypt's export performance were mixed, but not significant. Finally, the coefficient of autocorrelation (Rho) is positive and significant in equation (4.4) only.[22]

The results of the disequilibrium export equations (see table 4.2) show that the coefficient on the lagged quantity of

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[22] Khan (1974) has interpreted this coefficient as a proxy for restrictions imposed by importing countries against exports from LDCs. Thus, if this correct, such restrictions were not an effective factor in deteriorating Egypt's export performance. This, on the other hand, may imply that the problem is in the supply side of the economy.

exports, X_{t-1}, is very low, except in equation (4.9), where it is significant at 5 percent level. This implies that the actual quantity of exports adjust to the desired level of exports in virtually a year. Thus, the short-run elasticities in table 4.2 are not substantially different from the long-run elasticities in table 4.1.

From the estimates of income and price elasticities of the demand for exports, it can be concluded that Egypt does not face an infinitely elastic demand for her exports. Consequently, any variations in world income or export prices and domestic prices would affect the quantity of export demanded. This implies that devaluation could adjust relative prices to increase exports. However, this depends on the responsiveness of the supply of exports to changes in relative prices, to which we turn in the next subsection.

4.5.2 EXPORT SUPPLY

2SLS was employed in estimating the export supply equations outlined above. In the export supply-quantity equation, the coefficients on both export prices, px, and domestic prices, pd, in equilibrium and disequilibrium models have shown wrong signs. Similarly, the price supply elasticity of export equation of U.K and U.S has shown a wrong negative sign, but all the other coefficients are correctly signed (Haynes and Stone (1983 a). For Italy, Sabani (1989) also obtained a negative sign for the export price coefficient in the export quantity equation. In the case of LDCs, Arize's results (1987), for example, show that only one country (Upper Volta) out of eight African countries reveals a negative sign for the export price coefficient, and only Kenya has a negative sign for the domestic price coefficient. There are also similar results for Korea out of seven Asian countries (see Arize, 1990). All the other coefficients in the export supply equation for these countries have the expected signs.

This implies that the supply curve of Egypt's exports estimated from the supply-quantity equation is downward sloping. The results of estimation of supply-quantity equations for Egypt are not reported here. However, 2SLS estimates of export supply-price equations, which are given in table 4.3, show that the coefficient on the export quantity in the price-supply equations is negative throughout.

It can be seen that the capacity and capacity utilization variables, proxied by Y or TY and CY, respectively, have wrongly signed coefficients. The domestic price coefficient has the expected positive sign, and is significant at 5 and 10 percent level in equations (4.17) and (4.17), respectively. The coefficient on the quantity of exports is significant at the 1 percent level, but it has the wrong sign.

Table 4.3: 2SLS Estimates of Export Supply-price Equations (annual data: 1952-86)

Dependent Variable: $\ln px_t$

Explanatory Variables	Equilibrium Form of		Disequilibrium	
	eq. (4.17)	eq. (4.16)	eq. (4.17)	eq. (4.16)
Constant	0.998 (2.100)	-3.614 (0.697)	0.953 (1.986)	-3.591 (0.687)
$\ln X_t$	-0.701 (4.923)	-0.697 (4.692)	-0.657 (4.001)	-0.671 (3.944)
$\ln Y_t$	0.911 (7.941)		0.860 (4.903)	
$\ln TY_t$		1.985 (1.641)		1.948 (1.585)
$\ln CY_t$		0.685 (2.395)		0.672 (2.121)
$\ln pd_t$	0.529 (3.492)	0.448 (2.666)	0.453 (2.338)	0.403 (1.950)
$\ln px_{t-1}$			0.102 (0.594)	0.056 (0.314)
D_t	-0.147 (2.835)	-0.188 (2.983)	-0.153 (2.369)	-0.178 (2.630)
Rho	0.593	0.6643	0.545	0.618
DW	1.537	1.518	1.560	1.540
R^{-2}	0.953	0.953	0.959	0.959
F-Farley	2.908	2.362	3.245	3.662

t-values are in parentheses.
For F-Farley, see footnotes of table 4.1.

On the one hand, all these results could imply that the quantity and price of exports in Egypt are independently determined, i.e. prices might be determined by the demand side and quantities by supply factors. On the other hand, the positive sign of the capacity variable and the negative sign of the quantity of exports variable may be tentatively taken to suggest that production of exports in Egypt follows increasing returns to scale, which might suggest imperfect competition. However, further research on industrial production, and cost functions in Egypt, which is beyond the focus of the present study, is required to support this conclusion.

The stability test, F-Farley, is significant at 5 percent level, and implies that the estimated equations are stable. Thus the export supply-price equation can be specified with the level of domestic real income as a capacity variable. However, there is an autocorrelation problem, in both equations, indicated by the coefficient of Rho.

From these results it can be pointed out that the adjustment mechanism in a large open economy may not be valid for the supply of exports equation. Therefore, the hypothesis of a small open economy is tested in the next subsection.

4.5.3 EXPORT QUANTITY AND PRICE IN A SMALL OPEN ECONOMY

In the export price and quantity equations in a small open economy, the price of exports is assumed to adjust to world demand conditions, and export quantities adjust toward suppliers' desired values.[23] These equations were estimated using the same 2SLS method, as above. The results are given in table 4.4 for the supply-quantity equations and in table

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[23] See adjustment mechanisms in equations (4.18) and (4.19).

4.5 for the supply-price equations.

Table 4.4: 2SLS Estimates of Export Quantity Equations (annual data:1952-86)

Dependent variable: $\ln X_t$

Explanatory Variables	Export Quantity Equations (4.23)	(4.22)	(4.21)	(4.20)
Constant	1.119 (2.683)	1.251 (2.688)	-2.488 (0.594)	-3.690 (0.838)
$\ln Y_t$	0.525 (5.913)	0.600 (3.987)		
$\ln TY_t$			1.470 (1.527)	1.927 (1.780)
$\ln CY_t$			0.342 (1.295)	-0.390 (1.436)
$\ln(px/pd)_t$	-0.577 (5.393)		-0.598 (5.344)	
$\ln px_t$		-0.614 (4.935)		-0.662 (5.003)
$\ln pd_t$		0.526 (4.025)		0.509 (3.439)
$\ln X_{t-1}$	0.209 1.392)	0.195 (1.261)	0.040 (0.245)	0.002 (0.014)
D_t	-0.040 (0.777)	-0.049 (0.895)	-0.087 (1.462)	-0.110 (1.711)
Rho	0.158	0.169	0.408	0.415
DW	1.849	1.835	1.745	1.711
$\bar{R}^2$	0.837	0.833	0.831	0.827
F-Farley	1.865	1.450	0.956	1.373
F-R	0.370			

t-values are in parentheses

Results in the table above confirm that variations in export quantities are determined by changes in factors affecting supply, especially productive capacity (proxied by real GNP,or

Y). The coefficient on Y is significantly different from zero at the 1 percent level, in equation (4.23). This may suggests that a Keynesian income multiplier effect on exports exists. The coefficients on export prices are significant, but they have wrong negative signs, as the quantity of exports is assumed to be determined by the supply side. This might indicate that there is a data problem and hence the supply-quantity equations could be improperly identified. Furthermore, it seems that the capacity utilization has no significant effect on the quantity of exports, as the coefficient on CY is not significant, and exhibits the wrong sign in eq.(4.20). The capacity variable TY has the correct sign, but is not significant. This could imply that secular and cyclical income effects are not operating on export quantity equations in Egypt.

It is apparent from estimates in table 4.5 below that equation (4.24), both equilibrium and disequilibrium, is behaving slightly better than equation (2.25), as the stability test, F-Farley, shows that equation (4.24) is more stable than equation (4.25). However, in eq. (2.25) the coefficient on the quantity of exports, X_t, shows the correct (negative) sign, as the price of exports is assumed to adjust to the demand side. The coefficient on YW_t is correct, but is only significant at the 10 percent level. The coefficient on TWY is high, but has the wrong sign and is significant at 10 percent level. The coefficient on the world price,wp, exhibits the correct sign, and is significantly different from unity at the 1 percent level. This implies that export prices are determined by world prices, which is consistent with Egypt being almost is a price taker in the export market.

Table 4.5: 2SLS Estimates of Export Price Equations (annual data:1952-86)

Dependent variable: $lnpx_t$

Explanatory Variables	Equilibrium Form of eq.(4.25)	Equilibrium Form of eq.(4.24)	Disequilibrium (4.25)	Disequilibrium (4.24)
Constant	0.658 (2.190)	13.143 (2.364)	0.625 (1.896)	14.303 (2.250)
lnX_t	-0.595 (6.333)	-0.489 (4.511)	-0.586 (5.484)	-0.470 (4.016)
$lnYW_t$	0.213 (1.656)		0.223 (1.591)	
$lnTWY_t$		-2.892 (2.067)		-3.175 (1.992)
$lnCWY_t$		0.705 (2.909)		0.754 (2.817)
$lnwp_t$	1.207 (11.284)	1.514 (9.830)	1.179 (4.739)	1.507 (5.230)
$lnpx_{t-1}$			0.019 (0.119)	0.020 (0.138)
D_t	-0.073 (1.440)	-0.011 (0.228)	-0.073 (1.389)	-0.019 (0.377)
Rho	0.354	0.198	0.357	0.264
DW	1.764	1.844	1.737	1.789
R^{-2}	0.979	0.979	0.980	0.980
F-Farley	1.960	0.528	1.482	0.753

t-values are in parentheses.

The coefficient on the lagged dependent variable in both equations is very small and insignificant. This implies that the adjustment coefficient is virtually unity, and hence export prices adjust within almost a year. Moreover, the equilibrium equations are behaving slightly better, as the autoregressive coefficient, Rho, is not significant, especially for equation (2.24).

Generally, the small open economy hypothesis fits, to some extent, the determination of Egypt's export prices, especially in the equation specified with the world income, YW, as a capacity variable. However, Egypt's export prices are significantly determined by world prices. Thus, this result could imply that export prices are determined by both world prices and quantity of exports. This conclusion, therefore, does not support one of the main assumptions of studies by Dervis, Martin, and Van Wjinbergen (1984), and Dervis and Van Wjinbergen (1986) that export prices are determined only by quantity of exports. It is also to be noted that Faini, Clavijo, and Abdel Senhadji-Semilali (1988) obtained similar results for their manufactures export price equation in 15 out of 23 developing countries.

From estimates of export demand and supply equations, it may be concluded that the deteriorating performance of Egypt's commodity export sector over the examined period might due, to a large extent, to supply constraints rather than to demand restrictions. This conclusion supports Wilson's arguments (1984) that internal factors are the main constraints on exports rather than the importing countries' trading policies. Nevertheless, although a well-fitting export demand equation can be obtained, the export supply-quantity equations show negative price elasticity correlation and further work needs to be done to find a well-fitting export supply equation.

4.5.4 Import Demand

Equilibrium and disequilibrium import demand equations, which were described above, were estimated by 2SLS. Estimates for equilibrium equations are given in table 4.6.

All coefficients in table 4.6 have the expected signs. The DW statistic as well as the autocorrelation coefficient, Rho, show no sign of autocorrelation. The income elasticity of demand for imports is significantly different from unity at the 1 percent level (see eq. (4.29)). The coefficient on TY is not significantly different from unity at 5 percent level, but the coefficient on CY is significant at 5 percent level in equation (4.27). The coefficient on the relative import prices is significant at the 1 percent level, and has the correct sign. This implies that any variations in income or import prices would lead to changes in import demand. This result, also, supports Khan's (1974) findings that developing countries do not have a zero price elastic demand for imports.

An estimation of pm and pd separately in equations (4.26) and (4.28) reveals that both coefficients on pm and pd have the correct sign and are significantly different from zero at 5 and 1 percent levels, respectively. Moreover, testing for

Table 4.6: 2SLS Estimates of Import Demand Equations (Equilibrium Equations, annual data:1952-86)

Dependent variable: $\ln M_t$

Explanatory Variables	Import Demand Equations			
	(4.29)	(4.28)	(4.27)	(4.26)
Constant	-0.690 (1.467)	-0.850 (1.732)	-2.618 (0.528)	-2.089 (0.407)
$\ln Y_t$	1.223 (13.282)	0.992 (5.190)		
$\ln TY_t$			1.639 (1.534)	1.260 (1.095)
$\ln CY_t$			1.087 (3.052)	0.905 (2.372)
$\ln(pm/pd)_t$	-0.842 (4.828)		-0.817 (4.33)	
$\ln pm_t$		-0.690 (3.307)		-0.673 (3.075)
$\ln pd_t$		0.954 (4.846)		0.937 (4.334)
D_t	-0.489 (6.589)	-0.432 (5.146)	-0.501 (5.977)	-0.439 (4.601)
Rho	0.015	0.072	0.026	0.086
DW	1.986	1.925	1.972	1.921
R^{-2}	0.905	0.904	0.903	0.904
F-Farley	0.458	0.449	0.875	1.312
F-R	1.672			

t-values are in parentheses.

linear restrictions for equations (4.29) and (4.28) indicates that F-R is significant at the 1 percent level. Unlike Murray and Ginman (1976), Wilson and Takacs (1979), this result supports the traditional relative price formulation of import demand equation. On the other hand, this result also supports the predicted unidentifiable effects of income cyclical and secular changes on Egypt's demand for imports, especially in the short-run, see results in table 4.7. However, it seems there is a cyclical effect on the demand for imports in the long-run, as the coefficient on CY is significantly different from unity at 5 percent level, see table 4.6.

The coefficient of domestic prices is higher than that of import prices. This may indicate a possibility for import substitution if import prices rise and/or domestic prices decline. It is apparent that the three wars had led to a decline in aggregate imports, as the coefficient on the war dummy variable is negative and significant at the 1 percent level.

Considering the behaviour outside the equilibrium relationship, the disequilibrium import equations were estimated by 2SLS. Results are presented in table 4.7. Similar to the equilibrium model, all the coefficients have the expected signs. However, the short-run estimates of elasticities are slightly lower than the long- run estimates (see table 4.6).

Results of the disequilibrium equations, in table 4.7 below, indicate no substantial difference from those of the equilibrium ones, see table 4.6. The coefficient on lagged dependent variable has the expected sign, but it is small and is not significant in all equations. However, the stability test, F-Farley, and the linear restrictions test, F-R, indicate that the traditional specification of relative price in import demand equation is plausible in the case of Egypt.

Table 4.7: 2SLS Estimates of Import Demand Equations (Disequilibrium, annual data: 1952-86)

Dependent variable: $\ln IM_t$

Explanatory Variables	Import Demand Equations			
	(4.35)	(4.34)	(4.33)	(4.32)
Constant	-0.549 (1.142)	-4.015 (0.808)	-0.678 (1.386)	-3.209 (0.633)
$\ln Y_t$	0.980 (4.969)	0.707 (2.599)		
$\ln TY_t$			1.704 (1.623)	1.249 (1.112)
$\ln CY_t$			0.708 (1.626)	0.521 (1.147)
$\ln(pm/pd)_t$	-0.683 (3.310)		-0.623 (2.736)	
$\ln pm_t$		-0.509 (2.133)		-0.475 (1.170)
$\ln pd_t$		0.796 (3.657)		0.748 (3.070)
$\ln IM_{t-1}$	0.212 (1.497)	0.224 (1.500)	0.212 (1.497)	0.227 (1.541)
D_t	-0.373 (4.023)	-0.447 (4.925)	-0.373 (4.023)	-0.389 (3.882)
Rho	0.024	-0.003	0.024	0.038
DW	1.938	1.996	1.938	1.937
R^{-2}	0.903	0.906	0.900	0.903
F-Farley	2.234	2.162	1.820	1.517
F-R	0.688			

t-values are in parentheses.

4.5.5 IMPORT SUPPLY

The import supply equations, outlined above, were estimated by the same 2SLS method. Estimates of import supply-quantity equations are given in table 4.8 for both equilibrium and disequilibrium models.

Table 4.8: 2SLS Estimates of Import supply-quantity Equations (annual data: 1952-1986)

Dependent variable: $lnIM_t$

Explanatory Variables	Disequilibrium		Equilibrium	
	eq.(4.40)	eq.(4.39)	eq.(4.37)	eq.(4.36)
Constant	-0.810 (1.325)	-35.634 (1.715)	-1.190 (2.051)	-23.177 (1.119)
$lnYW_t$	0.302 (1.481)		0.391 (1.868)	
$lnTWY_t$		8.832 (1.736)		5.783 (1.139)
$lnCWY_t$		-1.580 (1.384)		-0.781 (0.693)
$lnpm_t$	-1.049 (2.505)	-0.487 (0.491)	-1.455 (4.029)	-0.555 (0.598)
$lnwp_t$	1.723 (3.209)	0.854 (0.534)	2.391 (5.765)	0.872 (0.585)
$lnIM_{t-1}$	0.257 (1.782)	0.327 (2.338)		
D_t	-0.389 3.559)	-0.324 (2.901)	-0.445 (4.248)	-0.419 (3.883)
Rho	-0.032	-0.126	0.097	0.080
DW	2.023	2.110	1.921	1.935
R^{-2}	0.893	0.897	0.892	0.893
F-Farley	1.568	1.850	0.028	0.258

t-values are in parentheses

It can be seen from estimates in table 4.8 that the coefficient on the lagged quantity of imports supplied is positive and significant at 5 percent level in equation (4.39) of the disequilibrium equations. This indicates that the response of import supply to changes an explanatory variables is subject to an average lag of three years, calculated as the inverse of the coefficient on the lagged dependent variable (see Cagan, 1956). It seems that the supply of imports was determined by the world capacity (proxied by OECD real GDP, YW, or the trend of GDP, TWY), but only the coefficient on TWY is significant at 10 percent level. Both the import prices and the world prices show the wrong signs. The income trend has the expected sign and the income business cycle variable has the wrong sign, but both are insignificant. These poor results may due either to a problem in identifying the supply equations and/or to data limitations. Hoewever, the stability test F-Farley is significant at 5 percent level for both equations in the disequilibrium and equilibrium model.

The above results indicate a negative relationship between the quantity and price of imports, which may not be correct in the case of imports of a small country. Thus, examining the small open economy hypothesis, where the price of imports adjust to the excess supply is undertaken by estimating the supply-price import equations and the estimates are given in table 4.9, below.

Table 4.9: 2SLS Estimates of Supply-Price Import Equations (annual data: 1952-86)

Dependent variable: $lnpm_t$

Explanatory Variables	Equilibrium Form of		Disequilibrium	
	eq.(4.43)	eq.(4.42)	eq.(4.43)	eq.(4.42)
Constant	-5.400 (3.499)	19.725 (9.347)	-1.078 (4.240)	18.143 6.413)
$lnYW_t$	0.401 (2.058)		0.252 (2.452)	
$lnTWY_t$		-4.848 (9.416)		-4.423 (6.235)
$lnCWY_t$		1.112 (11.796)		1.046 (8.900)
$lnwp_t$	1.399 (5.840)	1.584 (30.881)	0.823 (3.947)	1.406 (8.575)
$lnIM_t$	-0.069 (1.225)	-0.023 (0.615)	-0.149 (2.818)	-0.044 (1.057)
$lnpm_{t-1}$			0.306 (1.980)	0.124 (1.232)
D_t	-0.072 (1.823)	-0.059 (2.394)	-0.114 (3.285)	-0.062 (2.486)
Rho	0.995	0.029	0.546	0.005
DW	1.481	1.955	1.922	1.928
R^{-2}	0.991	0.997	0.995	0.997
F-Farley	23.190	1.446	8.931	2.008

t-values are in parentheses.

It can be seen from results in table 4.9, above, that equation (4.42) in both equilibrium and disequilibrium model is behaving better than equation (4.43), as in eq.(4.42) the stability test F-Farley is significant at the 5 percent and Rho indicates no sign of serial correlation. Results from equation (4.42) may indicate that the main determinant of import prices is the world price level, where the elasticity of the world prices, wp, is significantly different from unity at the 1 percent level.

This may imply that Egypt is also an import price taker. Also, import prices adjust to variations in the explanatory variables within a year, as the coefficient on the lagged import prices is low and insignificant, especially for equation (4.42). Therefore, the long-run elasticities are almost similar to the short-run elasticities, as can be seen from results of equation (4.42) for equilibrium and disequilibrium models.

4.7 CONCLUSIONS

The purpose of this chapter has been to examine the determination of Egypt's aggregate of exports and imports. Various versions of the demand for and supply of exports and imports have been estimated for the period 1952-86. Also stability and linear restriction tests were performed. From the results a number of conclusions can be drawn:

Firstly, demand for Egypt's exports is inelastic to world income. This implies that if the world income grows Egypt will capture only a small percentage of world exports. However, changes in both domestic and foreign prices are more significant as determinants of the world demand for Egypt's exports, as the relative price elasticity is close to unity.

Secondly, however, a problem remains in the supply of exports, where the theoretical relationship between the quantity supplied and prices is found to be wrongly signed in all cases examined. However, this might due to data problems and to Egypt being almost an export price taker. Therefore, results of estimating the quantity and price of export equations in a small open economy have shown that where Egypt's export prices are considerably determined by world prices and hence Egypt is an export price taker, the quantity of exports is mainly determined by supply factors. However, further work required to substantiate these results.

Thirdly, on the import side, relative prices and real income do play important roles in the determination of Egypt's demand for imports. An elasticity of import demand more than unity implies that a large percentage of domestic income growth can leak abroad. The elasticity of domestic price is higher than that of import prices. This may indicate a possibility of import substitution. To identify import substitutes, a disaggregated study of imports is required as well as the problem of mobilizing and allocating resources.

Fourthly, on the import side also, results of estimates of supply-price equation indicate that the world price level is the main determinant of Egypt's import prices. Thus, Egypt is also an import price taker.

Finally, the conventional Marshall-Lerner condition for a devaluation to improve the trade balance might be satisfied, as the sum of price elasticities of demand for exports and imprts exceeds unity. However, the four elasticities form of this condition is not satisfied, as the supply response for both exports and imports is not successfully identified due to estimation difficulties. On the other hand, devaluation may not be an effective expenditure-switch policy measure towards the adjustment of the balance of payments deficit because Egypt is a price taker for both exports and imports.

Consequently, it is difficult to fully agree with the IMF proposition that devaluation is an effective policy measure towards the adjustment of the balance of payments. The next two chapters examine the IMF assumptions with regard to the monetary sector, i.e. supply of and demand for money for Egypt.

CHAPTER 5

THE SUPPLY OF MONEY IN EGYPT

5.1 INTRODUCTION

It has been discussed earlier,in chapter 3, that one of the main assumptions of the Fund approach to the balance of payments adjustment is that the money supply is controllable. One may ask if the money supply can satisfy such an assumption. The present chapter aims to study money supply determination via some key questions. Is the money supply in Egypt exogenous, and hence under the control of the monetary authorities? What are the main instruments used in controlling the money supply, and were some or all these instruments effective? Thus, section 5.2 presents a fairly brief outline of the banking and financial system during the study period. Section 5.3 examines the components of the money supply over the sample period. Section 5.4 investigates the instruments that have been employed by the Central Bank to control the money supply. The theoretical framework of the function of the money supply is discussed in section 5.5. Section 5.6 presents the empirical results of money supply estimation. Section 5.7 provides a summary and conclusions.

5.2 THE BANKING AND FINANCIAL SYSTEM

Details of the historical background of Egypt's banking system are beyond the scope of the present study.[1] However, the structure and policies of this banking system are to be shown briefly over the study period (1952-86).

Since 1974 the Egyptian banking system has changed dramatically from being controlled by the Central Bank of Egypt (CBE) and five big commercial banks,[2] to an entirely different structure. This comprises the Central Bank of Egypt, commercial banks, certain specialized banks and saving facilities provided by the post office, and a group of new Egyptian and foreign banks that established after the inception of the open-door economic policy in 1974.

The size of Egypt's banking system increased, according to

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[1] The historical background of the Egyptian banking system has been investigated in several studies, see for example, CBE (1984),El-Gharib (1966), El-Zohry (1978, 1984), Kardouche (1966), Mousa (1976), Shoura Council (1983), and Sewelim (1974). Generally, the history of Egypt's banking system has been divided into the following six stages:
(i) The absence of national banks (1856-1920).
(ii) The establishment of national banks (1920-1956).
(iii)The Egyptianization period (1956-59).
(iv) The nationalization period (1960-64).
(vi) Bank specialization by sectors, i.e. each bank deals with specific activities, e.g. construction, industry, and so on (1964-1975).
(v) The establishment of foreign banks and liberalization of banking system as a consequence of the open-door economic policy which commenced in 1974.

[2] These commercial banks are namely: National Bank of Egypt, Banque Misr, Banque du Cairo, Bank of Alexandria, and Bank of Port Said.

recently available statistics, to reach 101 various banks and investment institutions. The structure of the Egyptian banking system is as presented in table 5.1.[3]

Table 5.1: Structure of The Egyptian Banking System

Banks	Number
1) Central Bank Of Egypt (CBE)	1
2) Commercial Banks, of which:	43
4 public sector banks. 39 joint venture and private banks.	
3) Non-commercial banks, of which:	54
a) 21 specialized banks, which are:	
18 agricultural banks 1 industrial bank 2 real estate banks	
b) 33 investment and business banks, which include:	
- 11 joint venture banks, which have 10 banks operating in both local and foreign currencies, and one bank operating in foreign currency only.	
- 22 branches of foreign banks.	
4) Non-registered banks with CBE	3

Source: CBE (1984, 1985/86).

The Central Bank of Egypt and the specialized banks accept some demand deposits, but the size of these deposits has always been insignificant. The commercial banks, on the other

[3] For more details about each group of these banks, see CBE **"Economic Review", No.3,1984**, and **"The Annual Report"**, 1985/86.

hand, dominate the acceptance of demand deposits. Nevertheless, they compete with the post office for time and saving deposits. As a result of this competition, as Mackenzie (1979) has pointed out there was a shift in the composition of total time and saving deposits away from the post office to the commercial banks. This is likely to be due to the spread of banking habits as the number of banks increased,in which deposit holdings in both domestic and foreign currencies rose.

In addition to time and saving deposits, which are provided by the commercial banks in two forms, time deposits, and saving deposits, for which no notice is required for their withdrawal, there is another liquid financial asset, government saving certificates. These certificates are issued in three types: one which can be liquidated without notice, the second which requires at least six months notice, and the third which is lottery certificates.

Out of the 34 foreign banks established under the provision of the 1974 law, 11 banks are joint venture being allowed to accept both domestic and foreign currencies, with the exception of one bank that deals in foreign currency only. The rest of these banks are branches of foreign banks. They accept only foreign currency.[4]

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[4] The role of foreign banks in the development of the Egyptian economy has been a subject of controversy. Mackenzie (1979) and El-Zohry (1984) argued that these banks have contributed in the expansion of the size and functions of the financial system, and brought the national banks in

In most LDCs, including Egypt, there are two types of money markets, which are organized and informal money markets. The organized money markets, however, are less integrated than those in developed countries, and they consist of institutional agencies of credit, which, in the case of Egypt, have been outlined above in table 5.1. The size and the relative growth of the organized money market may be measured by certain ratios, although it has been pointed out that none of these is perfect.[5] Nevertheless, in Egypt, the ratios of money deposits to GNP and banking system claims on the private sector to GNP have shown a significant increase since the mid-1970s. This may imply an increase in the banking system as well as in the size of the money market.

Wai (1957) described the informal (unorganized) money markets in LDCs as imperfect and less homogeneous than the organized money markets. The relationship between borrower and lender is an integral part of a much wider socioeconomic pattern of village life, and loans are granted on a personal basis.[6]

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competition with the foreign banks. In contrast, Abdel-Khalek (1981) has argued against the role that was played by such banks in the development of the Egyptian economy.

[5] These ratios are: (i) the ratio of deposit money to money supply, (ii) the ratio of banking system credit claims on the private sector, (iii) the ratio of currency to money supply, and (iv) the ratio of assets of all financial institutions to GNP. For more details about the money markets in LDCs, see e.g. Wai (1965), and Park (1973).

[6] Also for measuring the size of unorganized money markets and developments of interest rates in these markets between two periods ,1948-51 and 1968-71, see Wai (1980).

In Egypt, like many LDCs, information on the volume and transactions and interest rates in the unorganized money markets is not regularly available.[7] However, it has been argued by Eshag and Kamal (1967) that the volume of lending on such markets is very small and declining in Egypt. This can be attributed, to a large extent, to the rapid growth in official credit provided by agricultural co-operative banks, and the expansion of banking services after the liberalization policy in 1974.[8]

The capital market in Egypt, however, is strictly limited to longer-term financial assets, such as shares and bonds. Transactions in this market were small, declining, and unstable due to the closure of the stock exchange market for two months in 1961, followed by the nationalization laws in the same year. After the stock exchange reopened, overall transactions continued to be stagnant till the launching of the open door economic policy in 1974. Total transactions increased in 1975 and 1976, although in 1977 transactions declined as a result of issuing a law which exempted bank deposits and saving deposits from income tax. Meanwhile, the interest rates on bank deposits rose making bank deposits more attractive than bonds or securities. Despite some increases

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[7] Chandavarkar (1971) has pointed out that the share of unorganized money market in total credit supply in India seems to range from 50 to 70 percent. He also pointed out that interest rates range from 24 to 50 percent and above in the unorganized money market in LDCs.

[8] See more details in El-Zohry (1984), Eshag and Kamal (1967), and Mackenzie (1979).

in transactions, however, they are still low by any international standards.[9]

Finally, a question may be raised about the impact of such substantial changes in the banking and financial system on the behaviour of money supply in Egypt. To this we now turn.

5.3 QUANTITATIVE TRENDS OF THE MONEY SUPPLY

This section basically aims to show the evolution of the money supply over the study period, 1952-86. In Egypt as in all other countries, money is created by the banking system. As above for simplicity, the review period is divided into five year periods, as shown in table 5.2, which presents the components of the broad definition of money supply. However, the annual data of table 5.2 are plotted in fig. 5.1. From the table and the figure a number of observations can be drawn: firstly, the money supply was steadily increasing during the first twenty years, i.e. 1952-72, as the annual average of M3 increased by 177.9 percent over that period. Thereafter, the money supply was expanding rapidly, especially since the mid-1970s. The annual average of M3 increased by 1205.3 % over the period 1972-86. One implication of this may be a higher degree of monetization experienced by Egypt's economy, as the money supply to GNP ratio also increased sharply over the same period, and hence the velocity decreased, as can be seen from

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[9] The total of transactions in Cairo Stock Exchange in 1985/86 were 27.291 million in Egyptian pound,and 83.386 million in U.S. dollar (CBE, Annual Report, 1986/87, p.87).

figure 5.2.[10]

<u>TABLE 5.2</u>: MONETARY STATISTICS: Money Supply (1952-86)

An annual average of £E million, and % of total

Periods	Currency in Circulation		Demand Deposits(1)		Time& Saving Deposits		Total Money Supply,M3
	Value	%	Value	%	Value	%	Value
1952-56	198.7	50.9	119.3	30.5	72.6	18.6	390.6
1957-61	219.2	43.8	165.9	33.1	115.5	23.1	500.6
1962-66	387.7	46.4	193.7	23.2	253.6	30.4	835.0
1967-71	498.0	45.9	258.7	23.8	328.8	30.3	1085.6
1972-76	980.0	44.5	578.0	26.2	644.5	29.3	2202.5
1977-81	856.0	33.6	1930.0	22.7	3705.5	43.6	8491.3
1982-86	232.8	25.2	4718.2	16.4	16797.8	58.4	28748.8

(1) Includes post office savings deposits, and time and saving deposits of specialized banks.
Source: IMF,(IFS,various Issues).

Secondly, it is noticeable that all components of the money supply, M3, have undergone huge increases. Time and saving deposits accounted for the highest increase over the 1972-86 period, i.e. 2506.3 %. Demand deposits increased by 716.3 % and currency outside the banking system by 638 %.

The ratio of time and saving deposits to money supply rose dramatically to become more than one half of M3. Such a rapid growth may be an indication of the expansion of the banking

[10] See measures of monetization in LDCs in Chandavarkar (1977).

system and improvements in its services. Further, it could also be due to the attractiveness of bank deposits relative to other savings, as the former are exempted from income tax, as mentioned earlier. Finally, the ratio of currency outside the banking system to money supply is relatively high by international standards. Currency in circulation accounts for about 75 percent of the narrowly defined money supply, i.e. currency outside the banking system plus private demand deposits. This may due, to a large extent, to the slow process of clearing cheques, and to the fact that cheques are not widely accepted as a means of payment, despite the recent financial innovations and the improvement in banking services.

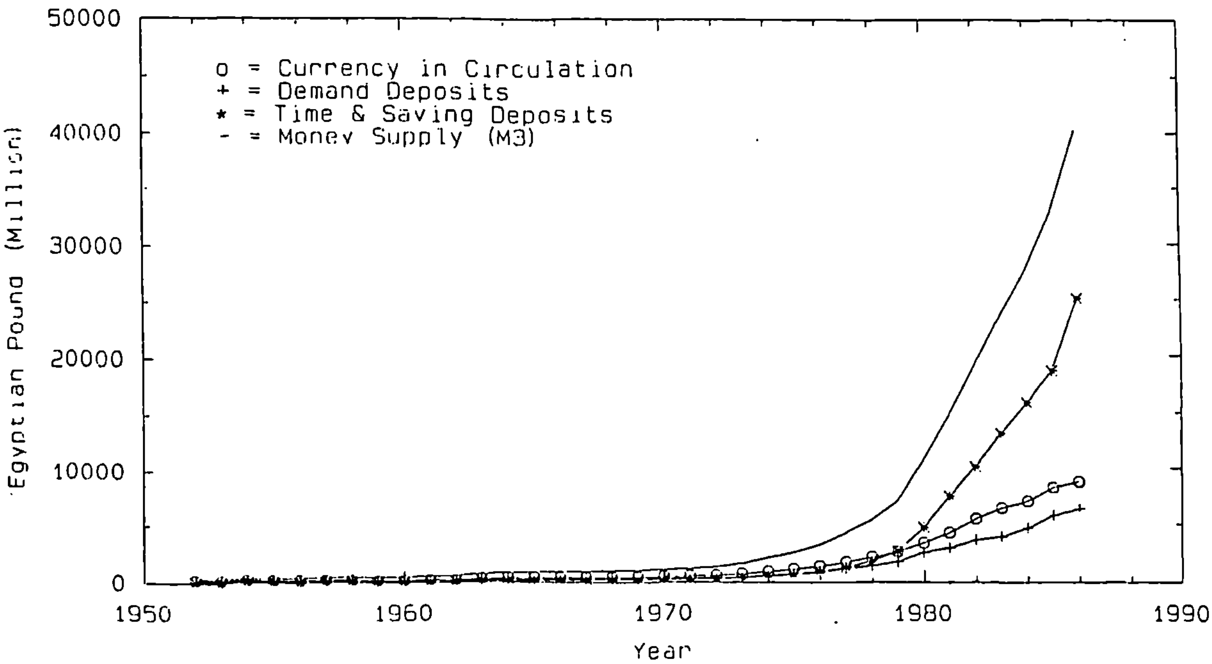

Figure 5.1: **Monetary Aggregates: Currency in Circulation, Demand Deposits, Time and Saving Deposits and Total Money Supply (M3).**

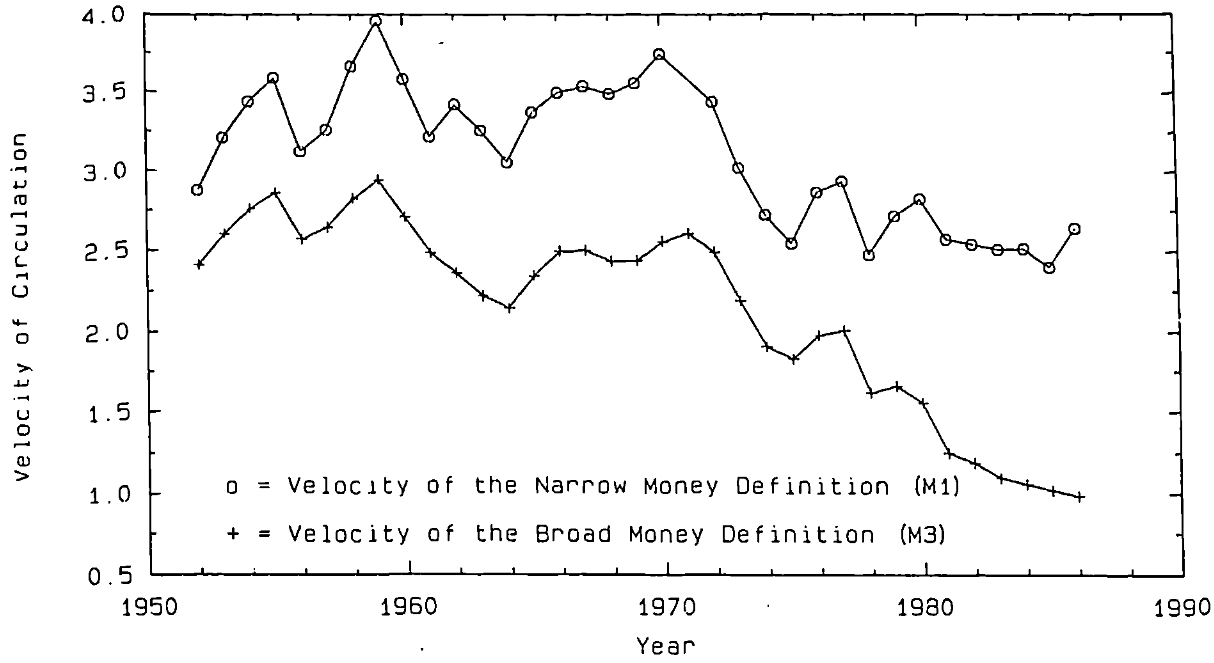

Figure 5.2: Velocity of Circulation of M1 and M3.

It is apparent that borrowing from the banking system by the government, to finance the fiscal deficit, is the major source of the expansion in the money supply during the sample period. This strong relationship between fiscal deficit and domestic credit is shown in figure 2.5 in chapter 2. Table 5.3 also presents domestic credit distributed among various sectors of the economy as well as the proportionate share of each sector in total domestic credit. It can be seen clearly, from table 5.3, that there was a rapid increase in domestic credit over the 1967-86 period. It is also noticeable that there has been a shift in proportionate shares of various sectors in total domestic credit. Since the introduction of nationalization in 1957 the government share surged to account for about 70 % by 1972, onwards. On the other hand, the share of the private sector declined dramatically, but it has increased as a result of the liberalization of the economy in 1974.

Table 5.3: Monetary Statistics: Domestic Credit (1952-86)

As annual average of £E million,and % of total

Periods	Claims on Government Sector Value	%	Claims on private Banks Value	%	Claims on Specialized Credit Value	%	Total Domestic Value
1952-56	80.6	33.6	145.6	66.4	0	0	226.2
1957-61	221.5	44.0	235.3	46.8	46.5	9.2	503.3
1962-66	540.5	55.4	321.4	32.9	114.1	11.7	976.0
1967-71	920.7	64.6	378.4	26.6	125.5	8.8	1424.6
1972-77	1979.4	69.8	690.2	24.3	168.0	5.2	2837.6
1978-81	8192.7	74.8	2427.7	22.2	329.9	3.0	10950.4
1982-86	22382.8	69.1	8746.6	26.9	1285.8	4.0	32415.2

Source: IMF, IFS, various issues.

The influence of government deficit on the money supply depends, to a large extent, on the source from which such a deficit is financed. It has been argued that in LDCs government deficits financed by borrowing from commercial banks do not affect either the monetary base or the money multiplier, and hence the money supply. But government deficits financed by borrowing from the central bank will lead to an increase in the monetary base and hence to a multiple increase in the money supply (Coats and Khatkhate, 1978, 1980). However, government expenditure does not only affect the monetary base (high-powered money) in LDCs, but also does so in some developed countries.[11]

In the case of Egypt, it seems that the government borrows more from the central bank than from commercial banks to finance its deficit, as can be seen from table 5.4 below. Therefore, any increases in the government deficit will spill over into the money supply via increased borrowing from the central bank.

Table 5.4: Government Borrowing from the Banking System, Distributed Among the Central Bank and Commercial Banks

Millions of Egyptian pound,and % of total(1)

Periods	Central Bank		Commercial Banks		Net Claimsof the banking system on government
	value	%	value	%	
1952-56	78.3	97.1	2.3	2.9	80.6
1957-61	211.2	96.8	10.3	3.2	221.5
1962-66	355.3	66.2	187.2	33.8	540.3
1967-71	485.4	52.9	435.3	47.1	920.7
1972-76	1082.9	54.8	896.5	45.2	1979.5
1977-81	4986.0	72.4	1647.9	27.6	6633.9
1982-86	13370.6	89.4	1649.8	10.6	15020.4

(1) Annual averages.
Source: IMF, (IFS, various issues).

[11] The empirical results of Arestis, Frowen, and Karakitsos (1978) seem to support the significant influence of government expenditure over the monetary base in the Federal Republic of Germany, Canada, and the U.K., but not in the U.S.A.

Studying the data in table 5.4 above we can note that government borrowing from the banking system during the first ten years of the sample period (1952-61) was heavily concentrated towards the central bank, as the government borrowing from the latter accounted for 97 % of total borrowing from the banking system. Over the next ten years or more (1962-75) the ratio of government borrowing from the central bank declined sharply, while that from commercial banks rose dramatically. This shift in government borrowing towards commercial banks can be attributed to the nationalization of the banking sector among other sectors of the economy, as mentioned above. In addition, it can be attributed to the allocation of banks according to bank specialization by sectors and function during the period 1964-75. Thus, as long as the banking sector was, among other sectors, liberalized in 1974, the ratio of government borrowing from the central bank increased rapidly to reach an annual average 89 % of the government total borrowing from the banking system over the period 1982-86.

In addition to the government borrowing from the central bank, which is a reflection of the budget deficit as mentioned above, there are two other sources that influence the monetary base and hence the money supply. First is the central bank credit to commercial banks. The second is the central bank holding of foreign assets, which are affected by the balance of payments position, over which the monetary authorities may have a marginal control. Furthermore, it has been argued that because of the foreign trade patterns of LDCs, their foreign exchange assets tend to be unstable in the short-run and more subject to externally generated fluctuations than those of developed countries (see Park, 1973).

Components of Egypt's monetary base are presented in table 5.5, as well as the ratio of each to the total monetary base,for the sample period.

Table 5.5: Components of Egypt's Monetary Base (1952-86)

An annual average and % of total

Periods	CB Net Claims on Government		CB Credit to Commer.Banks		CB Net Foreign Assets		Reserve Money
	value	%	Value	%	value	%	value
1952-56	78.3	24.8	10.6	3.4	219.5	72.7	308.4
1956-61	211.2	73.7	24.2	8.5	50.4	17.8	285.8
1962-66	353.3	83.5	126.4	27.5	- 49.8	-11.1	429.8
1967-71	485.4	71.3	338.1	49.3	-141.8	-20.6	681.8
1972-76	1082.9	83.8	647.8	49.3	-461.1	-33.1	1269.7
1977-81	4986.0	130.0	1284.0	42.7	-2447.2	-72.8	3822.8
1982-86	13370.6	106.0	829.2	6.3	-1427.4	-12.5	12772.4

Source: IMF (IFS, various issues).

This table shows quite clearly that central bank net credit to the government dominated the monetary base (reserve money) over the whole period, as the claims on the government increased from an annual average 24.8 % to 106 % in the periods 1952-56 and 1982-86, respectively. Foreign assets of the central bank contributed negatively to the growth of the monetary base during most of the reviewed period. This, on the other hand, is an indication of the persistent deficit in the balance of payments. Finally, central bank credit to commercial banks has shown a considerable increase during the 1962-76, but it declined very fast later.

In sum, the stock of money is mainly influenced by changes in the monetary base. It has been shown that the monetary authorities might not fully control two components of the monetary base, namely; the central bank net credit to the government and net foreign assets. However, the central bank credit to commercial banks could be a source of control of money supply. Where the monetary authorities can limit the ability of commercial banks to create credit, and hence control the money supply by employing various monetary policy instruments. In the light of the high rate of monetary expansion experienced by Egypt's economy, one may raise questions about the effectiveness of monetary policy instruments in money supply control. Thus, whether or not monetary policy instruments have been used effectively to control money supply is to be considered briefly in the next section.

5.4 INSTRUMENTS OF MONEY SUPPLY CONTROL

The money supply, as discussed above, is created through lending by the banking system to various sectors in the economy, and via net foreign assets. Among the monetary instruments that the Central Bank of Egypt is authorised to use to control the money supply are the discount rate as well as creditor and debtor interest rates, the reserve ratio, the liquidity ratio and open market operations. In addition, the foreign exchange rate regime employed will have implications for control of the money supply. In the following we discuss each of these instruments briefly.

5.4.1 The Discount Rate

Variations in the discount rate, which is fixed by the central bank, may affect the money supply via the cost and the availability of bank lending. Ceteris paribus, the higher the discount rate, the higher the cost that commercial banks pay for borrowing from the central bank, and hence the lower the availability of bank credit. Furthermore, if the structure of interest rates is connected to the discount rate, any increases in the latter are expected to raise the former,and the result is a decline in the demand for bank credit.

However, the experience of Egypt with the discount rate over the study period reveals that the Central Bank of Egypt does not rely heavily on this instrument to control the money supply. The rate was constant at 3 % till 1962 in which it was raised and remained at 5 % until 1975. As a result of liberalization of the economy, in general, and the banking system, in particular, the discount rate was raised, since 1975, every year and sometimes twice a year to reach 13 % in

1982. However, whether these changes in the discount rate have affected the controllability of money supply in Egypt or not is to be examined empirically below. On the other hand, if the discount rate and interest rate were pegged, the authorities had to provide whatever quantity of money was required by the public at those interest rates. Consequently, the money supply over the study period would be endogenous.

5.4.2 The Reserve Ratio

The reserve ratio is the proportion of deposits that commercial banks are obliged to hold with the central bank, as reserves. Therefore, the central bank can use this ratio to influence the ability of lending of commercial banks. Other things being equal, the higher the reserve ratio, the lower the money multiplier, and hence the money supply.

Prior to 1962, the reserve ratio was mainly used for allocation of bank credit to the financing of the cotton crop. The reserve ratio was reduced from 12.5 % to 10 % during the cotton season. In May 1962, as a result of the IMF stabilization programme, this ratio was raised to 17.5 %. Later, the ratio was increased to 25 % of the daily average of deposit balances in local currency. In July 1981, it was decided that all registered banks were to keep 15 % of their deposits in foreign currencies with the central bank. Nevertheless, with the exception of changes in the reserve ratio in order to finance the cotton crop, there is little evidence of the use of changes in this ratio by the central bank to control the money supply.

5.4.3 The Liquidity Ratio

Commercial banks are able to increase their lending ability in the face of a higher reserve ratio imposed by the central bank. This is done through converting some of their liquid assets into cash. Therefore, the central bank may control the money supply by limiting the volume of such liquid assets held by commercial banks.

The liquidity ratio was introduced in Egypt in 1958, as the Central Bank of Egypt compelled the commercial banks to hold 30 % of their liabilities in cash. Since then the liquidity ratio remained unchanged. This indicates that the central bank did not rely on this ratio in controlling the money supply over the sample period.

5.4.4 Credit Ceilings

The central bank is allowed to impose quantitative limits on bank credit so as to constrain any expansion in the money supply. The credit ceiling, in fact, is the most direct and effective method to control bank credit and hence money supply. However, credit ceilings would not restrain domestic money supply growth if such ceilings were limited to domestic bank credit, as credit could be obtained elsewhere, e.g. from abroad, when domestic ceilings were approached (see Coats and Khatkhate, 1980).

The Central Bank of Egypt sets out ceilings and sub-ceilings on commercial bank credit to various sectors of the economy. Moreover, in some cases credit would be prohibited from financing certain transactions, e.g. credit for buying and selling durable consumer goods, such as private cars (see CBE, 1984).

Mackenzie (1979, p. 22) has pointed out that " **The Egyptian authorities seem to rely exclusively on credit ceiling guidelines to the banks**". Nevertheless, in view of the rapid rate of domestic credit expansion and money supply growth that Egypt has been experiencing since the mid-1970s, it is difficult to conclude that this direct method was used effectively by the central bank to control the doestic credit expansion. This might due to the fact that the government has been the main borrower from the banking system, see table 5.3 above. In addition, it seems that domestic credit ceilings were mainly used to allocate more credit to the private sector, as recommended by IMF adjustment programmes. The rate of domestic credit expansion to the government sector, including the public sector, and to the private sector over the sample period is shown in figure 5.3.

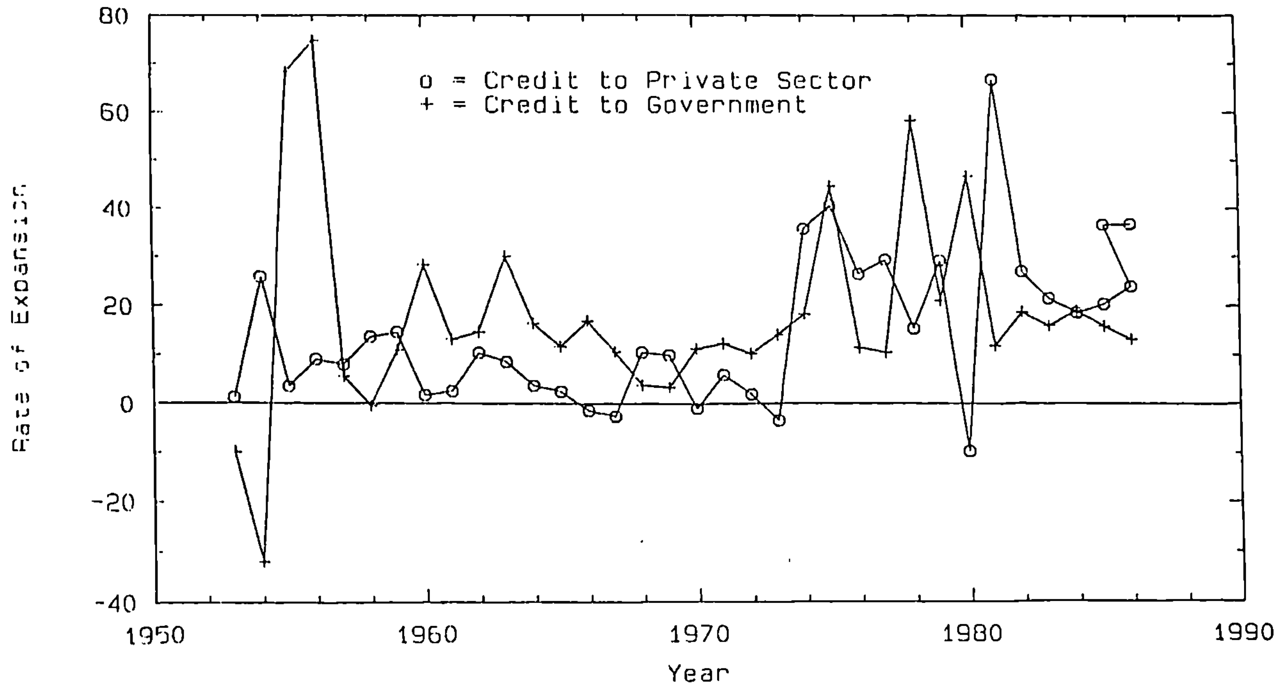

Figure 5.3: **The Rate of Change in Domestic Credit to the Private and the public Sectors.**

It can be seen from this figure (5.3) that the monetary authorities have succeeded, to some extent, in reducing the rate of growth of domestic credit expansion, but there has been an increase in the rate of growth of domestic credit to the private sector relative to that of the government sector.

5.4.5 Open Market Operations

Open market operations can be defined as the purchase and sale of securities by the central bank so as to influence the quantity of money. The use of this method, however, requires highly developed money and capital markets, which do not exist in most LDCs. Therefore, open market operations have been rather more important in developed countries than in LDCs.

As mentioned above the capital market in Egypt is very limited in terms of the volume of transactions. This may have limited the use of open market operations as a monetary policy instrument.

5.4.6 Exchange Rate Regime

Under fixed exchange rates the monetary authorities are not capable of controlling the money stock, independently, in the long-run as the balance of payments surplus or deficit will affect the monetary base, and hence the money supply, until balance of payments equilibrium is restored. Moreover, neutralization of the impacts of the balance of payments on the money supply is limited to the central bank's ability to reduce or accumulate foreign reserves. On the other hand, under flexible exchange rates, changes in exchange rate offset the effects of balance of payments on the monetary base and hence the money supply in the long-run is more amenable to control by the authorities.

It has been shown earlier, in chapter (2), that Egypt has experienced a complex multiple exchange rate system. Therefore, it might be difficult to determine clearly the influence of such an exchange rate system on the controllability of the money supply. Nevertheless, it can be argued that the monetary authorities had some potential to control upon the money supply. This comes from the fact that the exchange rate has been adjusting, particularly from the early 1970s, onwards, and a considerable amount of foreign transactions took place on the free market pool at a relatively flexible exchange rate. Additionally, some foreign exchange controls and restrictions on current and capital transactions, especially before the liberalization policy, have been exercised by the authorities.

5.5 THE MONEY SUPPLY FUNCTION

The supply of money function is based on the money multiplier approach, in which the money supply is the product of a money multiplier and reserve money (high-powered money or the monetary base).[12] Thus, the money supply function can be expressed as:

$$M_t = m\, H_t \tag{5.1}$$

Where M_t is the nominal stock of money, narrowly or broadly defined, m is the money multiplier, and H_t is the stock of high-powered money. The money multiplier can be defined as follows:[13]

[12] The money supply function can also be specified using the portfolio approach rather than by the multiplier. This, however, requires a highly developed money market, which does not exist in most LDCs, including Egypt. For empirical use of the portfolio approach, see Jonson (1975,1976).

[13] The money multiplier is based on a system of equations relating to currency, demand deposits, time deposits, and reserves, for details, see Friedman and Schwartz(1963), and

$$m = \frac{1 + c}{a\ (\ 1-b\ ) + c} \tag{5.2}$$

c is the ratio of currency to demand deposits, a is the ratio of reserves to demand plus time deposits, and b is the ratio of time deposits to demand deposits. Therefore, the money supply function can be rewritten as:

$$M_t = \frac{1 + c}{a\ (\ 1-b\ )+ c}\ H_t \tag{5.3}$$

According to equation (5.3) the change in the nominal money supply is determined by changes in both reserve money and the money multiplier. The change in the money multiplier, m, can be determine by analyzing its components. This, however, could be difficult in the absence of a complete model of Egypt's banking system, and adequate data, especially, for the ratio a, which depends on bank reserves. Therefore, this ratio is assumed to be an exogenous parameter determined by the banking system.

On the other hand, the ratios c and b are determined by the public's preferences for various monetary assets and the attractiveness of these assets, which depends mainly on rates of return. Therefore, it could be useful to examine the portfolio preferences of the public for different assets. The

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Park (1973).

desired ratio of currency outside the banking system to demand deposits depends on income. Also the public may hold less currency in favour of demand deposits for institutional factors, such as the degree of monetization or the growth of the banking system. Thus, the desired ratio of currency to demand deposits can be expressed in log-linear form as:

$$\ln(C/D)^{*}_{t} = a_{o} + a_{1} \ln y_{t} + a_{2} \ln r_{t} + a_{3} \ln INST_{t} \qquad (5.4)$$

C denotes the currency in circulation, D refers to demand deposits, y is real income, r is interest rate, and INST is a proxy for institutional factors, measured by the degree of monetization, i.e. money supply to GNP ratio.[14] Similarly, the desired ratio of time deposits to demand deposits depends among other things on interest rates in the informal money market, ur, as higher interest rates in this market could drive time deposits out of the banking system, thus,

$$\ln(T/D)^{*}_{t} = b_{o} + b_{1} \ln y_{t} + b_{2} \ln r_{t} + b_{3} \ln INST_{t} + b_{4} \ln ur_{t} \qquad (5.5)$$

It is assumed that the public adjust its actual ratios of currency and time and saving deposits to demand deposits according to a partial adjustment mechanism. Given that A1 and A2 are the adjustment coefficients for (C/D) and (T/D),

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[14] For various ratios of monetization in LDCs, see Chandavarkar (1977).

respectively, the following reduced form equation can be derived for their actual ratios:

$$\ln(C/D)_t = A_1 a_o + A_1 a_1 \ln y_t + A_1 a_2 \ln r_t + A_1 a_3 \ln INST_t + (1 - A_1) \ln(C/D)_{t-1} \qquad (5.6)$$

$$\ln(T/D)_t = A_2 b_o + A_2 b_1 \ln y_t + A_2 b_2 \ln r_t + A_2 b_3 \ln INST_t + A_2 b_4 \ln ur_t + (1 - A_2) \ln(T/D)_{t-1} \qquad (5.7)$$

Identity (5.3), however, can be used to determine the effects of variations in the money multiplier and the monetary base on the change in the money supply. A study of Egypt's data over the sample period reveals that there is no significant variation in the money multiplier during the 1961-mid 1970s period. Since then the money multiplier for narrowly defined money, M1, declined sharply. In contrast, the money multiplier for broadly defined money,M3, rose rapidly. Therefore, changes in the money supply can be mainly attributed to the change in the monetary base. Given the fact that the money multiplier depends on the money stock, the money supply function, eq. (5.3), is to be reformulated under the assumption of a constant money multiplier.[15] Thus, the money supply function can be reexpressed in log-linear form as follows:

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[15] The money supply function here is based on several studies, particularly for LDCs, see e.g. Aghevli (1977), Aghevli and Khan (1977, 1978), Coats and Khatkhate (1980), and Khan (1977), Also for France see Meltzer (1959).

$$\ln M_t = c_o + c_1 \ln H_t \tag{5.8}$$

It is also assumed that an increase in the reserve money or high-powered money, H, expect to lead to an increase in money supply with declining weight, k, in the money supply, M. Thus, after applying the Koyck transformation to eq. (5.8), the following reduced form equation is derived,

$$\ln M_t = kc_o + kc_1 \ln H_t + (1 - k) \ln M_{t-1} \tag{5.9}$$

Eq. (5.9) explains the money supply as a function of high-powered money and the lagged stock of money, High-powered money can be defined as:

$$H_t = GC + BC + NFA \tag{5.10}$$

where GC is the central bank net credit to government, BC is the central bank credit to commercial banks, and NFA is net foreign assets. Substituting for eq. (5.10) into eq. (5.9), we obtain the following money supply function:

$$\ln M_t = kc_o + kc_1 (\ln GC + \ln BC + \ln NFA)_t + (1 - k) \ln M_{t-1} \tag{5.11}$$

As explained above, government credit from the central bank is a reflection of the government budgetary policy, i.e. the budget deficit (G - T). To examine the impact of each component of Equation (5.11) on the money supply, it can be written as:

$$\ln M_t = ka_0 + ka_1 \ln(G - T) + ka_2 \ln BC + ka_3 \ln NFA + (1 - k) \ln M_{t-1} \tag{5.12}$$

The preceding discussion of the monetary policy instruments has revealed that only two have experienced some variation, the discount rate, DR, and the reserve ratio, RR. The monetary authorities normally change these instruments to exert some influence on the money multiplier or on the DCM, and hence on the money supply. Thus, the money supply function may be tested through estimating the money multiplier equation with DR and RR as exogenous variables:

$$\ln m_t = h_0 + h_1 \ln DR_t + h_2 \ln RR_t, \quad h_1 < 0 \ , \ h_2 < 0 \tag{5.13}$$

5.6 EMPIRICAL RESULTS

OLS was employed to estimate the money supply function described in the preceding section. The estimation process is carried out using three definitions of money, i.e. M1, M2, and M3. A war dummy variable, D_t, which is one in war years and zero elsewhere, is included in each equation.[16] Where a lagged dependent variable is included the durbin h-statistic was estimated to test for the presence of autocorrelation. Estimated coefficients of independent variables in the equation for the ratio of currency in circulation to demand

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[16] For data sources, see Appendix C.

deposits, (C/D), are presented in the following table.

Table 5.6: OLS Estimates of the Ratio of Currency to Demand Deposits, Eq.(5.6), (annual data: 1952-86)

Dependent Variable	Coefficients on						
	const.	lny_t	lnr_t	$ln(C/D)_{t-1}$	D_t	R^{-2}	h
$ln(C/D)_t$	2.209 (2.527)	-0.290 (2.440)	0.300 (2.446)	0.747 (7.002)		0.64	0.97
$ln(C/D)_t$	2.384 (2.386)	-0.313 (2.737)	0.333 (2.804)	0.659 (5.896)	0.075 (1.934)	0.67	2.09

- t-statistics are in parentheses.
- R^{-2} is adjusted for degrees of freedom.

Results in the table above reveal that the coefficient on real income has the expected sign and is significantly different from zero at 5 percent level in the two versions of the equation, i.e. without and with the war dummy variable. The lagged dependent variable is positively related to the dependent variable and is significantly different from zero at 1 percent level. However, the coefficient on interest rates shows a wrong sign in the two estimated equations. The ratio of currency to demand deposits had increased during wartime, as indicated by the positive sign of the war dummy variable at the 10 percent significant level. However, the Durbin h-statistic in the second equation indicate the presence of serial correlation.[17]

[17] Following Khatkhate, Galbis, And Villanueva (1974) the foreign interest rate, measured by interest rates in the Euro-dollar market, was used instead of the domestic interest rates in estimation of equation of currency to demand deposits ratio, but it has always shown a wrong sign. Also including the monetization ratio as a proxy for the improvement in the

Results from estimation the ratio of time and saving deposits to demand deposits are reported in table 5.7, below.

Table 5.7: OLS Estimates of the ratio of Time and Saving Deposits to Demand deposits (Various versions of equ. 5.7)

Coeff.	eq.(1)	eq.(2)	eq.(3)	eq.(4)	eq.(5)	eq.(6)
Const.	-3.554 (2.523)	-2.550 (1.858)	-1.491 (0.969)	-1.527 (0.951)	1.040 (0.795)	1.010 (0.759)
$\ln y_t$	0.414 (2.505)	0.332 (1.817)	0.214 (1.231)	0.219 (1.191)	-0.310 (1.759)	-0.302 (1.669)
$\ln r_t$					-2.400 (0.548)	2.826 (0.615)
$\ln ur_t$					-1.382 (0.311)	-1.831 (0.392)
$\ln Fr_t$	-0.082 (0.819)	-0.429 (0.383)	-0.303 (0.318)	-0.344 (0.328)		
$\ln INST_t$			0.571 (2.499)	0.580 (2.322)		
D_t		-0.632 (0.830)		0.008 (0.102)		-0.020 (0.372)
$\ln(T/D)_{t-1}$	0.709 (6.020)	0.752 (6.324)	0.589 (4.971)	0.584 (4.440)	0.450 (4.529)	0.463 (4.347)
R^{-2} DW	0.931 1.94	0.941 1.96	0.939 1.84	0.939 1.83	0.963 1.83	0.963 1.87

t-values are in parentheses

In the table above, the lagged dependent variable is highly significant in determining the level of time and saving deposits to demand deposits ratio. As a result of using foreign interest rates, Fr, measured by eurodollar market interest rate, instead of the domestic interest rates the

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banking system shows the wrong sign. Therefore, they were dropped from the estimated equations in table 5.6.

coefficient of income shows the correct sign and has become significant at 5 percent level in eq. (1). However, the coefficient of foreign interest rate shows the wrong sign in all equations, i.e. (1) - (4).

The institutional factor, i.e. lnINST, which measures improvements in the banking system shows the correct sign and is significantly different from zero at the 5 percent level. However, introducing the interest rates in organized and informal money markets does not improve the performance, as shown in equations (5) and (6). This might imply that the size of the informal money market in Egypt is not significant, as mentioned above. The coefficients on income and interest rates in the informal money market show the wrong sign, only the coefficient on the interest rate in the organised money market show the correct sign, but it is high and insignificant.

The money supply function, eq. (5.12) has been estimated for the three definitions of money, i.e. M1, M2, and M3. All the estimated parameters, which are not reported here, show the correct signs and are significant at different levels. However, there is a serial correlation problem in all estimated equations. Therefore to overcome the serial correlation problem, the money supply equation was estimated in first differences. Results of estimation for the three definitions of the change in money are presented in the following table. Each equation is estimated with and without the war dummy variable.

Table 5.8: OLS Estimates of the Supply for Money (equation 5.12), First Differences: annual data, 1952-86

Indepen. Variables	d lnM1 eq.(1)	d lnM1 eq.(2)	d lnM2 eq.(1)	d lnM2 eq.(2)	d lnM3 eq.(1)	d lnM3 eq.(2)
Const.	-0.731 (0.943)	-0.898 (1.161)	-0.915 (1.164)	-0.094 (1.209)	-0.075 (1.014)	0.077 (1.060)
d $\ln(G-T)_t$	0.150 (2.544)	0.145 (2.498)	0.102 (1.817)	0.094 (1.674)	0.083 (1.563)	0.074 (1.401)
d $\ln BC_t$	0.040 (1.402)	0.047 (1.648)	0.024 (0.917)	0.029 (1.124)	0.38 (1.481)	0.047 (1.815)
d $\ln NFA_t$	0.137 (1.139)	0.013 (1.119)	0.018 (1.444)	0.016 (1.245)	0.014 (1.198)	0.011 (0.925
D_t		0.043 (1.361)		0.037 (1.177)		0.043 (1.451
d $\ln M_{t-1}$	0.508 (3.078)	0.593 (3.404)	0.580 (3.664)	0.674 (3.823)	0.678 (4.416)	0.798 (4.644
R^{-2}	0.487	0.501	0.620	0.625	0.662	0.672
H	1.30	0.50	0.78	0.48	2.15	1.32

All the coefficients on the predetermined variables in table (5.8) above, show the expected signs. Furthermore, the Durbin-h statistic tests indicate the absence of serial correlation, except for d lnM3 with the exclusion of the war dummy variable.

Attempts by the monetary authorities to influence the money multiplier through changes in the discount rate and the reserve ratio are considered by estimating the relationship between these variables and the money multiplier. The results of estimation are reported in the table below.

Table 5.9: OLS Estimates of the Coefficients of the Money Multiplier Equation (5.13): annual data,1952-86

Independent Variables	eq. (1)	eq. (2)
Constant	0.172 (3.748)	0.177 (3.652)
$\ln DR_t$	0.322 (2.556)	0.332 (2.557)
$\ln RR_t$	-0.020 (0.599)	-0.023 (0.661)
D_t		-0.379 (0.379)
R^{-2} DW	0.728 0.77	0.721 0.78

Results in the table above suggest that variations in the discount rate, DR, have not affected the money multiplier, as its coefficient exhibits the wrong sign. On the other hand, variations in the reserve ratio, RR, appear to have some influence on the money multiplier, but the coefficient is insignificant. There is also a problem of serial correlation as indicated by the DW-statistic. Therefore, it is to be noted that the conventional monetary policy instruments are not able to provide a satisfactory interpretation of variations in the money multiplier. The implication of this is that variations in the money multiplier has not played a significant role in controlling the money supply in Egypt.

5.7 SUMMARY AND CONCLUSIONS

It has been discussed that Egypt's capital market is strictly limited, but the banking system has undergone considerable changes, particularly, since the early 1970s. The money supply has been growing very rapidly since the early 1970s also. However, a study of the monetary policy instruments indicates that except for the credit ceiling there has been no significant attempts to employ the other policy instruments to restrain the dramatic growth in the money supply, especially since the early 1970s.

Regarding the results of the estimation of the supply of money function, a number of conclusions can be drawn. Firstly, the public preference for various monetary assets has been tested via the ratio of currency in circulation and time and saving deposits to demand deposits. These ratios appear to be significantly determined by their level in the previous year and real income only. Consequently, the money multiplier was considerably influenced by the level of national income. Secondly, variations in the components of the monetary base explain virtually all changes in the money supply, but in the estimated equation there is a problem of autocorrelation. This problem, however, is examined through an estimation of the money supply function in terms of first differences, but remains unresolved.

Thirdly, changes in the money supply seem to be significantly affected by bank credit to government. Finally, it appears difficult to explain variations in the money multiplier through changes in conventional monetary policy instruments, such as the discount rate and reserve ratio. The former is not effective at all, and the latter is not significant. Nevertheless, these conclusions should be taken with caution because of the misspecification problems in most of the examined equations, which may make the empirical evidence on the money supply function appear inconclusive. However, there is strong support for the endogeneity of the money supply and hence money in Egypt may be demand determined. Therefore, the authorities had to provide the quantity of money demanded. Consequently, it is quite appropriate to model the demand for money in the short-run as a function of interest rates, income, and prices, as will be done in the next chapter.

CHAPTER 6

THE DEMAND FOR MONEY IN EGYPT

6.1 INTRODUCTION

It has been shown previously that IMF adjustment programmes involve performance criteria that put limits on aggregate domestic credit expansion. The formulation of targets in such programmes is based on the assumption that there is a stable demand for money function. Given the predicted rate of change in prices and the potential real rate of economic growth, a particular rate of monetary expansion will be consistent with the growth in demand for money. An appropriate rate of domestic credit expansion is then required for the target of zero balance of payments. Domestic credit expansion above or below this rate will cause a rise or fall in the growth of money supply, resulting in inflationary or deflationary pressures, which bring about a deterioration or improvement in the balance of payments.[1]

However, it has been argued in the previous chapter that the money supply is endogenous, and hence money is demand determined. Therefore, this makes modelling demand for money in the short-run as a function of interest rate, income, and

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[1] This basic ideas have been developed by Polak (1957), explained in chapter (3).

prices quite appropriate. In this chapter, the demand for money is specified in two types of distributed lag model. The first is based on both stock adjustment and adaptive expectations. The second is the error correction model,which is one of the most recent models applied to dynamic adjustment in the demand for money function.

The main purpose of this chapter is to investigate whether or not there is a stable demand for money function in Egypt during the study period, 1952-86. To do so, the previous empirical evidence on the demand for money in Egypt is reviewed in section 6.2. Section 6.3 discusses the use of stock adjustment and adaptive expectations models in LDCs. The theoretical specification for stock adjustment and adaptive expectations demand for money function is given in section 6.4.

Section 6.5 presents the method of estimation as well as the estimated results of the first model (stock adjustment and adaptive expectations). In section 6.6 we consider the formulation of the error correction model. The empirical results of estimating such a model in Egypt are reported in section 6.7. Section 6.8 examines the stability of the two models. Section 6.9 reports simulation results of the two models. Conclusions are given in section 6.10.

6.2 PREVIOUS EMPIRICAL EVIDENCE ON DEMAND FOR MONEY IN EGYPT

As far as the demand for money function in Egypt is concerned, it can be pointed out that in most previous studies, which are very few, the demand for money has been specified in terms of real current values of income, interest rates and inflation rates. They all employed annual data (see Sewelim, 1974, Mackenzie, 1979, and Crockett and Evans, 1980).

Mackenzie, however, has employed the adaptive expectations hypothesis in order to generate the expected rate of inflation to examine its ability to measure the opportunity cost of holding money. The expected inflation rate was rejected because of its insignificant role as an explanatory variable in the demand for money function by El-Sheikh (1982). This was due to the low level and absent trend for inflation rate during his sample period (1940/50-1967/68). Lagged dependent variables have been used by the first two studies (Sewmelim and Mackenzie) as explanatory variables to model partial adjustment. In general, the income variable and lagged money balances are found to be significant with the expected signs.

However, the cost of holding money balances variables,both interest rates and expected rate of inflation are found to be insignificant, except in Sewelim's study,and in Teleb's study (1985), which employs quarterly data for the 1970s onwards . Because of the insignificance of the opportunity cost variables, Mackenzie and Crockett and Evans reestimated the demand for money as a function of current income only. Moreover, the estimates for these variables do not have the correct signs, as will be shown below. It seems that Teleb (1985) claims that his demand for money function, which was unusually specified with the assumption of nonhomogeneity in prices, is better specified than the previous ones. In Teleb's study, the income variable, whether current or expected real income, has the right sign, and is significant in several versions of the demand for money function, which have been estimated for three definitions of money, M1, M2, and M3. The cost of holding money, which was represented both by the expected rate of inflation and the nominal interest rates, is highly significant with the correct sign. However, there is an obvious autocorrelation problem. In addition, his study period has coincided with the liberalization of the economy, and witnessed annual changes in interest rates not hitherto experienced, as well as in inflation rate.

The adaptive expectations equations for obtaining permanent income and expected rate of inflation have previously been employed in Egypt in the demand for money function with an application of the Koyck transformation (Scobie,1983). Such a function was estimated using annual data for the period, 1947 - 1981. The three exogenous variables, income, rate of inflation and lagged money balances have demonstrated the expected signs and were significant at the 10 percent level only. However, the problem of the serially correlated error term has not been considered, and the stability of such equation was not tested. Furthermore, the demand for money function in Scobie's study is based on the assumption that the money market is in continual equilibrium.

El-Sheikh (1982) has rejected the partial adjustment hypothesis because the lagged dependent variable does not improve the fit of his equation, as measured by R^{-2} only. On the contrary, our results show that the inclusion of the lagged dependent variable increased the fit of the demand for money equation and its coefficient is highly significant for the three definitions of money, m1, m2 and m3, see results in table 6.4 below. Also, when the lagged money stock was included the rate of interest and the inflation rate coefficients exhibited the correct signs and became significant, especially for m1 (see tables 6.4 and 6.5 below).

In the present study, therefore, expectations are introduced to allow for a distributed lag, with the assumption of disequilibrium in the money market. Furthermore, the current interest rate is included in the demand for money function. The interest rate was almost constant in the first two decades, i.e. up to the early 1970s. Therefore, it is not expected that interest rate will have a substantial effect on the demand for money, although since 1973 it has shown some variation.

6.3 STOCK ADJUSTMENT AND ADAPTIVE EXPECTATIONS: Basic Outline

Distributed lag models of demand for money have mostly been employed in developed countries. However, there are a few studies directed to the monetary sector in less-developed countries (LDCs), e.g. Adekunle (1968), Khetan and Waghmore (1971), Wong (1977) and Morgan (1979). Before considering the arguments of some of these studies, it is necessary to discuss the reasons for using expectations or lags. The rationale given for distributed lags concerns uncertainty about the future, technological and institutional rigidities, such as market imperfection for many goods and large costs resulting from changes in pattern of expenditure (see Nerlove, 1958, pp. 5-14).

There are also portfolio adjustment costs to consider, and financial markets in most LDCs, including Egypt, are underdeveloped and imperfect. Therefore, the degree of uncertainty is higher in these countries. Thus, distributed lags could be employed in the monetary sector of LDCs.

Additionally, Feige (1967) has suggested that expectations play an important role in the behaviour of the monetary sector. On the contrary, in a comparative study of the demand for money in both developed and LDCs, Adekunle (1968) has argued that the lags can be ignored in LDCs' demand for money function because of the rationale given above for distributed lag, i.e. uncertainties and risks are relatively high. However, there are arguments which support employing lags in LDCs monetary sector because money holders in these countries are risk averse. Therefore, they tend to be more cautious in adjusting their portfolios, and longer expectation lags are to be predicted, giving smaller adjustment coefficients (Wong, 1977). This could imply that distributed lag models may perform well with employing annual data, particularly in the case of most LDCs, where the income series are published on an annual basis only. However, it has been pointed out that quarterly data perform better in this kind of model (Khetan and Waghmore, 1971, White, 1978, and Stevenson et al, 1988). Other studies, however, employed annual data,for example Feige (1967) and Adekunle (1968). Furthermore, Wong (1977) has pointed out that employing quarterly or annual data is an empirical matter.

6.4 SPCIFIC DEMAND FOR MONEY MODELS

6.4.1 Model I (General Model)

There is widespread agreement that the demand for real money balances is positively related to a scale variable and negatively related to the opportunity cost of holding money.[2] The demand for real desired money function can be specified as:

[2] See Laidler (1985) for comprehensive theoretical and empirical discussion of the demand for money. For a survey of the post-1973 literature, see Judd and Scadding (1982).

$$m^*_t = f(y_t, c_t) \tag{6.1}$$

where m^*_t is real desired money balances, y_t is the scale variable which is usually measured by permanent (expected) or real measured income and c is the variable relating to the opportunity cost of holding money which is normally measured by the interest rate or the expected rate of inflation or both. Thus, equation (6.1) can be rewritten as:

$$m^*_t = f(y_t, r_t, p^{\cdot}_t) \tag{6.2}$$

Where y_t is real expected income, r_t is the nominal interest rate, and $p^{\cdot}_t$ is expected rate of inflation. Equation (6.2) can be expressed in log linear form as follows:

$$\ln m_t = a_0 + a_1 \ln y^e_t + a_2 \ln r_t + a_3 p^{\cdot e}_t \tag{6.3}$$

Where y^e_t is the expected real income, r_t is as defined above, and $p^{\cdot e}_t$ is the expected rate of inflation, and a1, a2, and a3 are the income, the interest rate, and the rate of the change of prices elasticities, respectively. Equation (6.3) assumes that the demand for money is homogeneous of degree one in prices.[3] It is assumed that the actual demand for money, m_t, does not adjust instantaneously to the desired level of money. m^*_t, but rather by a partial adjustment mechanism.

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[3] A test of homogeneity is performed. The results show that this assumption holds.

$$\ln m_t - \ln m_{t-1} = d_1 (\ln m^*_t - \ln m_{t-1}) \tag{6.4}$$

where d_1 is the adjustment coefficient, and m_t is actual real money balances. Equation (6.4) implies that the actual stock of money adjusts proportionately to the difference between the demand for real desired money balances in the current period and the actual real stock of money in the previous period.

Substituting equation (6.3) into equation (6.4), we obtain the actual demand for real money balances as a function of expected income, nominal interest rates, the expected rate of inflation and real money stock lagged for one period, thus:

$$\begin{aligned} \ln m_t = {} & d_1 a_o + d_1 a_1 \ln y^e_t + d_1 a_2 \ln r_t + \\ & d_1 a_3 p^{\cdot e}_t + (1-d_1) \ln m_{t-1} + u_t \end{aligned} \tag{6.5}$$

Equation (6.5) includes two unobserved variables, expected real income, y^e_t, and expected rate of inflation, $p^{\cdot e}_t$. These variables are to be obtained by employing the adaptive expectations mechanism for y^e_t and $p^{\cdot e}_t$, respectively, as follows:

$$\ln y^e_t = \ln y^e_{t-1} + b_1 (\ln y_t - \ln y^e_{t-1}) \tag{6.6}$$

$$p^{\cdot e}_t = p^{\cdot e}_{t-1} + b_2 (p^{\cdot}_t - p^{\cdot e}t-1) \tag{6.7}$$

These expectations equations follow Nerlove's adaptive expectation function (1958).[4] Equation (6.6) and (6.7) imply that the expected real income and the expected rate of inflation are revised in proportion to the errors associated with their previous levels of expectation. Since the two equations are linear in logarithms, b_1 and b_2 are elasticities of income and inflation rate expectations, respectively.

By rearrangement of equation (6.6) and (6.7), we obtain them in these forms:

$$\ln y^e_t = b_1 \ln y_t + (1 - b_1) \ln y^e_{t-1} \tag{6.8}$$

$$p^{\cdot e}_t = b_2\, p^{\cdot}_t + (1 - b_2)\, p^{\cdot e}_{t-1} \tag{6.9}$$

Equations (6.8) and (6.9) can be solved for their past values of observed y and p,

$$\ln y^e_t = b_1 \, [y_t+(1-b_1)\ln y_{t-1}+(1-b_1)^2 \ln y_{t-2} +..+ (1-b_1)^n \ln y_{t-n} \, . \,] \tag{6.10}$$

$$p^{\cdot e}_t= b_2[p^{\cdot}_t+(1-b_2)p^{\cdot}_{t-1} +(1-b_2)^2 p^{\cdot}_{t-2} +....+ (1-b_2)^n \, p^{\cdot}_{t-n} \, ..] \tag{6.11}$$

Thus, the above expectations generating equations for real income and inflation rate can be seen as distributed lags

[4] A similar expectations equation for the rate of inflation was used by Cagan (1956).

with geometrically declining weights, and with b_1 and b_2 less than unity.

A special case of equation (6.5), which includes income, interest rates, and the lagged money balances, has been widely employed in estimating the demand for money function. This has been done by constraining the elasticity of expectations to equal unity, and hence to define the demand for money function in terms of current real or nominal income (or per capita income and money balances) and current interest rates (Friedman (1956), Artis and Lewis (1974, 1976). Some other studies have directly employed Friedman's permanent income hypothesis to generate a series of expected income, constraining the elasticity of income expectations to be equal to 0.4 (Meltzer, 1963). In the case of LDCs, demand for money functions have been mostly specified in current income and expected rate of inflation, which was taken to be equal to the current rate of inflation, as a proxy for the opportunity cost of holding money (Aghevli, et al, 1979, and Crockett and Evans, 1980).

To complete the derivation of the estimated equation, we substitute for equations (6.10) and (6.11) into equation (6.5), and applying the Koyck transformation twice in succession, we obtain the following reduced form equation for the demand for real money balances:[5]

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[5] See Kmenta (1971) and Harvey (1981).

$$\ln m_t = A_o + A_1 \ln m_{t-1} - A_2 \ln m_{t-2} + A_3 \ln m_{t-3} +$$
$$A_4 \ln y_t - A_5 \ln y_{t-1} + A_6 \ln r_t - A_7 \ln r_{t-1} +$$
$$A_8 \ln r_{t-2} + A_9 p^{\cdot}_t + A_{10} p^{\cdot}_{t-1} - A_{11} D_t -$$
$$A_{12} D_{t-1} + A_{13} D_{t-2} + W_t \qquad (6.12)$$

D is a war dummy variable,which is equal to unity in war years,which were 1956 and 1967 - 1973. This variable is introduced to capture the war effects on the demand for money. In addition, El-Sheikh (1981) has included one more dummy variable in his empirical work to capture the effect of institutional changes on the demand for financial assets in Egypt. Coefficients of equation (6.12) are combinations of the structural parameters of equations (6.5), (6.10) and (6.11).

The error term of the reduced form equation (6.12) can be expressed in terms of the original disturbance term as

$$W_t = d_1 u_t - d_1[(1 - b_1)(1 - b_2)]\ u_{t-1} + d_1(1 - b_1)(1 - b_2) u_{t-2}$$

The reduced form equation (6.12) contains 13 explanatory variables and eight structural parameters only. Thus, this equation is overidentified in the structural parameters. Therefore, OLS estimates will be biased and inconsistent. In order to overcome this problem equation (6.12) is to be estimated by some method other than OLS.

However, estimates of the structural parameters would be subject to bias due to the presence of autocorrelated disturbance term of the reduced form equation (6.12). In order to avoid this, we postulate that the reduced form disturbance term is to follow the second order form of ARMA (autoregressive moving average) scheme:

$$u_t = c_1\, u_{t-1} - c_2\, u_{t-2} + e_t \tag{6.13}$$

c_1 and c_2 are the autoregressive coefficients and e_t is a normally independent disturbance term with zero mean and constant variance. Combining equation (6.13) with equations (6.5), (6.10) and (6.11), the resulting reduced form equation for estimation purpose is

$$\begin{aligned} \ln m_t = {} & A_0 + A_1 \ln m_{t-1} - A_2 \ln m_{t-2} + A_3 \ln m_{t-3} - \\ & A_4 \ln m_{t-4} + A_5 \ln m_{t-5} + A_6 \ln y_t - A_7\, y_{t-1} + \\ & A_8\, y_{t-2} - A_9 \ln y_{t-3} + A_{10} \ln r_t - A_{11} \ln r_{t-1} + \\ & A_{12} \ln r_{t-2} - A_{13} \ln r_{t-3} + A_{14} \ln r_{t-4} + A_{15}\, p^{\cdot}_t - \\ & A_{16} p^{\cdot}_{t-1} + A_{17}\, p^{\cdot}_{t-2} + A_{18}\, p^{\cdot}_{t-3} + A_{19}\, D_t - \\ & A_{20}\, D_{t-1} + A_{21}\, D_{t-2} + A_{22}\, D_{t-3} + A_{23}\, D_{t-4} + e_t \end{aligned} \tag{6.14}$$

Equation (6.14) contains 23 variables, with ten structural parameters that are overidentified.[6] Unique estimates of all the structural parameters can be obtained simultaneously by FIML or by the non-linear least squares estimation procedure.

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[6] The structural parameters of Equation (6.14) are presented in table C.1 in the appendix.

6.4.2 Model II (Static Expectations for inflation)

Alternative forms of the above demand for money function can be derived by changing one or more of the model assumptions. This may help in determining the best specification of the demand for money parameters. First, consider the assumption that the rate of inflation expectations is static, i.e. $b_2 = 1$.

Substituting equation (6.10) into equation (6.5), and applying the Koyck transformation, we obtain the following reduced form equation:

$$\begin{aligned} Lnm_t = {} & B_o + B_1 \, lnm_{t-1} - B_2 \, lnm_{t-2} + B_3 \, lny_t + B_4 \, lnr_t \\ & - B_5 lnr_{t-1} + B_6 \, p^{\cdot}_t - B_7 \, p^{\cdot}_{t-1} + B_8 \, D_t - \\ & B_9 D_{t-1} + v_t \end{aligned} \tag{6.15}$$

When equation (6.15) is corrected for a first order autoregressive coefficient of the error term, the resulting reduced form equation is:

$$\begin{aligned} lnm_t = {} & B_o + B_1 \, lnm_{t-1} - B_2 \, lnm_{t-2} + B_3 \, lnm_{t-3} + \\ & B_4 \, lny_t - B_5 \, lny_{t-1} + B_6 \, lnr_t - B_7 \, lnr_{t-1} + \\ & B_8 \, lnr_{t-2} + B_9 \, p^{\cdot}_t - B_{10} \, p^{\cdot}_{t-1} + B_{11} \, p^{\cdot}_{t-2} \\ & + B_{12} \, D_t - B_{13} \, D_{t-1} + B_{14} \, D_{t-2} + e_t \end{aligned} \tag{6.16}$$

Similarly, equation (6.16) is overidentified in its structural parameters because it contains eight predetermined variables and seven structural parameters.[7] FIML or nonlinear estimation methods will again provide estimates for all the structural parameters of the model.

6.4.3 Model III (Static Expectations for Income)

The second alternative is to specify the demand for money function with the assumption that expectations of real income are static, i.e. $b_1 = 1$. Thus the demand for money function is to be related to real current income rather than to expected income.

Combining equations (6.5), (6.11), and the first order autoregressive coefficient of the normally distributed error term (with zero mean and constant variance), and applying the Koyck transformation, we obtain the following reduced form equation:

$$\begin{aligned} \ln m_t = {} & c_o + c_1 \ln m_{t-1} - c_2 \ln m_{t-2} + c_3 \ln m_{t-3} + \\ & c_4 \ln y_t - c_5 \ln y_{t-1} + c_6 \, nly_{t-2} + c_7 r_t \\ & - c_8 \ln r_{t-1} + c_9 \ln r_{t-2} + c_{10} p^{\cdot}_t - \\ & c_{11} p^{\cdot}_{t-1} + c_{12} D_t - c_{13} D_{t-1} + \\ & c_{14} D_{t-2} + e_t \end{aligned} \qquad (6.17)$$

The coefficients of equation (6.17) can be expressed in terms of the structural parameters of the model as presented in

[7] The structural parameters of equation (6.16) are in table C.2 in the appendix.

table C.3 in the appendix.

6.4.4 Model IV (Static Expectations for Inflation and Income)

The demand for real money balances can be specified alternatively under the assumption that expectations on both income and inflation are static, i.e. $b_1 = b_2 = 1$. Thus, real money balances can be a function of current real income, nominal interest rates, current inflation rates, and the lagged explanatory variable,

$$\begin{aligned} lnm_t = \; & d_1 \, a_o + d_1 \, a_1 \, lny_t + d_1 \, a_2 \, lnr_t + \\ & d_1 \, a_3 \, p^{\cdot}{}_t + (1 - d_1) lnm_{t-1} + u_t \end{aligned} \tag{6.18}$$

Equation (6.18) is the partial adjustment model for the demand for money function,which is described as a "standard function" (Artis and Lewis, 1974).

6.4.5 Model V (Traditional Demand for Money Equation)

Other forms for the demand for money function can be derived by relaxing the partial adjustment and expectations assumptions, i.e. $d_1 = b_1 = b_2 = 1$, thus

$$lnm_t = a_o + a_1 \, lny_t + a_2 \, lnr_t + a_3 \, p^{\cdot}{}_t + u_t \tag{6.19}$$

Equation (6.19) is in log-linear form for the demand for money function,and it can be estimated by OLS. Additionally, the demand for real money balances can be specified as a function of expected income, expected interest rate, and expected rate of inflation. Series of these expected variables are to be constructed using equations (6.8) and (6.9), with values of b_1 and b_2 ranging between 0.1 - 1.

6.4.6 Model VI (Expected Income as the only Explanatory Variable)

Examining the conclusion of previous studies that the interest rates and the expected rate of inflation are not significant as explanatory variables in Egypt's demand for money function, it is assumed that the demand for real money balances is related to expected real income only. Combining the expected real income, equation (6.10), with the mentioned demand for real money balances equation and correcting the resulting equation for a first order autoregressive scheme, the following reduced form equation for the demand for real money balances is obtained:

$$\ln m_t = D_0 + D_1 \ln m_{t-1} - D_2 \ln m_{t-2} + D_3 \ln m_{t-3} + D_4 \ln y_t - D_5 \ln y_{t-1} + e_t \tag{6.20}$$

The reduced form parameters of equation (6.20) are expressed in their original structural parameters, as well as the autoregressive coefficient in table C.4 in the appendix.

Estimates of the various structural parameters of the model are expected to be as follows: $0 < d_1$, $0 < b_1$, $0 < b_2$ 1, a_1 is to be positive, a_2 is to be negative, and a_3 is to be negative. The estimation methods as well as estimated results are to be illustrated in the next section.[8]

6.5 METHOD OF ESTIMATION AND EMPIRICAL RESULTS OF STOCK ADJUSTMENT-ADAPTIVE EXPECTATIONS MODELS

Estimation of reduced form equations, which include many distributed lags, by ordinary least squares (OLS) would result in a problem of multicollinearity. In addition, there is another problem in the presence of an autocorrelated disturbance term. The full information maximum likelihood method (FIML) is used in estimating the above reduced form equations.[9] This method gives the same results as non-linear least square methods, where the former maximizes the log of likelihood function and the latter minimizes the residual sum of squares.

These methods are capable of estimating simultaneously, without the imposition of prior restrictions, the behaviourial elasticities, a_1, a_2, a_3, and a_4, the expectations elasticities, b_1 and b_1, and the adjustment elasticity, d_1. These methods are also capable of estimating the autoregressive coefficients, c_1 and c_2, as any other parameter in the model.

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[8] For data sources, see Appendix: C.

[9] For data definitions and sources, see <u>Appendix C</u>.

FIML estimates of various elasticities in the general model, equation (6.14) are to be presented in table 6.1. This equation has been obtained and estimated where the disturbance term follows a second-order autoregressive process. Similar specifications for the demand for money function have been estimated with the error term following only a first-order autoregressive process (Feige, 1967, Khetan, 1971, and Wong, 1977). Others estimated the demand for money function under the assumption of non-autocorrelated disturbance term, which might give biased estimates (Adekunle, 1968, and Morgan, 1979). Therefore, the present study is a step forward in modelling and estimating the adaptive expectation version, especially as it takes into account all the recommendations by Villanueva (1971), that could increase the precision of the parameter estimates.[10]

The above studies, except Villanueva's, have followed the nonlinear techniques of Zellner et al (1965), which were based on a given value of the autoregressive coefficient. The FIML method has been employed for testing a distributed lag model with an autocorrelated error term, but with a given value of the autoregressive coefficient, (Zellner et al,1970). However,the assumption of a given value for autoregressive coefficient is rejected and it should be estimated like the

[10] Villanueua (1971) argües that the adaptive expectation could increase the precision of the parameter estimates and allow a systematic lag between the supply and demand for money in the following cases: i) when the error term of the reduced equations follows a second- order of higher autoregressive mechanism; and ii) including more explanatory variables.

other parameters in the model (see Johnston, 1985, p. 323). Therefore, the present study estimates the autoregressive coefficients and the other elasticities in the model simultaneously. However, in the FIML programme as well as nonlinear least squares, which have been employed, constant terms have to be imposed.

Table 6.1: FIML Estimates of the Structural Parameters in Model I (equation (6.14)

Explan. Variables	m1 Coeff.	m1 t-value	m2 Coeff.	m2 t-value	m3 Coeff.	m3 t-value
Const.	-10.764	n.c(a)	-3.434	n.c.	-3.124	n.c.
c_1	0.251	0.970	-0.015	0.025	-0.082	0.029
c_2	-0.336	2.028	-0.372	1.101	-0.235	0.106
b_1	0.437	2.495	0.339	1.645	0.373	1.088
b_2	0.538	2.136	0.308	1.528	0.230	0.936
d_1	0.698	1.982	0.566	1.304	0.571	0.908
y_t	2.392	3.167	2.673	3.239	2.329	3.950
r_t	-0.525	1.343	-0.183	0.291	-0.048	0.075
$\dot{p}_t$	-0.021	0.778	-0.058	0.637	0.041	0.408
D_t	-0.015	0.310	-0.017	0.262	-0.002	0.032
R^{-2}	0.993		0.996		0.997	
DW	1.38		1.28		1.38	
S	0.058		0.051		0.048	

(a) not calculated.
c_1 = first-order autoregressive coefficient.
c_2 = second-order " " .
b_1 = the elasticity of expectations of income.
b_2 = " " " " " inflation.
d_1 = adjustment coefficient.

One thing to be noticed in table 6.1 is that the signs of all the structural parameters are the expected ones for the three definitions of money, m1, m2 and m3. However, the income elasticity, a_1, at 2.3 to 2.7 is very high compared with the average income elasticity of demand for money in LDCs, but it is less than that in some countries.[11] However, the estimated income elasticity in the reduced form equation (6.14) is, also higher than that estimated in previous studies on the demand for money function in Egypt. For example, Mackenzie (1979) has found elasticities for broad money of about 1.5. Crockett and Evans (1980) have estimated these elasticities of 1.67, 1.83, and 1.76 for three definitions of money, M1, M2, and M3, respectively, but none of these studies estimated a demand for money function like equation (6.14).

Furthermore, under a similar approach Diz (1970), for annual data, obtained a high income elasticity for the demand for money in Argentina, i.e. 2.351. Also, Deaver (1970) and Khan (1977), for quarterly data, estimated an income elasticity for Chile as high as 2.305. The high income elasticity of demand for real money balances implies that money is a luxury good in Egypt. This is to be examined in the next chapter.

The estimated values of the autoregressive coefficients, c_1

[11] Aghevli, Khan, Narvekar, and short (1979) in a study of six asian countries found elasticities ranging from 1.33 to 1.82 for a broad definition of money. Morgan's estimates (1977) for five oil exporting countries, incorporating a Koyck-type lag structure, were of long-run income elasticities ranging from 1.41-1.82. Parikh and Starmer (1989) obtained income elasticity 1.54 for narrow money, m1, and 2.87 for broad money in the case of Bangaldesh.

and c_2 are not significant for the broad definitions of money, m2 and m3, but the second- order autoregressive parameter, c_2, is negatively significant at the 10 percent level for narrow money, m1. The income elasticity of expectations is significantly different from zero at the 5 percent level for m1, and at the 10 percent level for m2, but not significant for m3. Similarly, the price elasticity of expectations is significant at 5 and at 10 percent levels for m1and m2,respectively, but it is not significant for m3. The adjustment elasticities of actual to desired real money balances are .698, .566 and .571 for m1, m2 and m3 respectively. This may be interpreted to imply that the speed of adjustment of actual to desired money balances is not very rapid,especially if we take into account that annual data are used. Similar estimates of the adjustment elasticities have been found by El-Sheikh (1981). His estimates of annual adjustment elasticities are: 0.95 for time deposits, 0.73 for demand deposits, 0.65 for currency in circulation and 0.42 for saving deposits. Therefore, he has concluded that a static model is more appropriate for the first three monetary assets and long-term assets, such as saving deposits may be represented by the dynamic model, and he (1982) also,as we mentioned above has rejected the partial adjustment hypothesis for the aggregate demand for money.

While the interest rate elasticity shows the expected negative sign for the three definition of money, it is significant at the 10 percent level for m1 only. On the other hand, the elasticity of the rate of change in prices is insignificant for m1,m2 and m3. The parameters on the dummy variables show that the wars affected the demand for m1, m2 and m3 negatively, but not significantly.

The FIML estimates of the structural parameters of Model II, equation (6.16), in which b_2 (the elasticity of inflation expectations) is put equal to unity, are presented in table 6.2.

Table 6.2: FIML Estimates of the structural Parameters in Model II (equation (6.16)

Explan. Variables	m1 Coeff.	m1 t-value	m2 Coeff.	m2 t-value	m3 Coeff.	m3 t-value
Const.	-7.828	n.c.(a)	-2.324	n.c.	-2.280	n.c.
c_1	0.565	2.556	0.596	2.382	0.576	1.904
b_1	0.530	5.668	0.224	2.914	0.239	2.60
d_1	0.747	4.763	0.889	3.437	0.849	2.698
y_t	1.738	5.093	1.865	4.296	1.765	3.932
r_t	-0.426	1.481	-0.126	0.626	-0.030	0.155
$\dot{p}_t$	-0.007	1.623	-0.005	1.666	-0.003	1.148
D_t	0.060	1.483	0.051	1.346	0.054	1.197
R^{-2}	0.990		0.994		0.995	
DW	1.76		1.74		1.76	
S	0.095		0.082		0.076	

(a) not estimated.
c_1 = first-order autoregrisive coefficient.
b_1 = the elasticity of expectations of income.
d_1 = adjustment coeefficient.

It can be seen from the results in table 6.2 that the income elasticities are 1.74, 1.86 and 1.76 for m1, m2 and m3, respectively. These elasticities are virtually inside the range of income elasticities in LDCs, and are almost the same as those estimates of Crockett and Evans (1980), especially for m2 and m3. The estimates of income expectation elasticities are, .54, .22 and .24 for m1, m2 and m3, respectively. These elasticities do not vary widely from those in equation (6.14). Similarly, actual money balances adjust rapidly to the desired levels, since the adjustment elasticities are .75, .89, and .85 for m1, m2 and m3, respectively. This implies that actual money adjusts to its desired level slightly faster for the broad money definition. The elasticity of interest rate is only significant at the 10 percent level for m1, as is that of equation (6.14). Despite including the current rate of inflation, its coefficient, a_3, is significant at 10 percent level only for all definitions of money. Finally, the war dummy variable demonstrates a positive effect on the demand for real money balances, m1, m2 and m3, at the 10 percent significance level. However, the autoregressive coefficient indicates the presence of autocorrelation in the error term.

It can be noted that the broad money definition, m3, behaves slightly better than narrow money, m1 in equation (6.14) and (6.16), especially if we consider the determination factor, R^{-2}, and the residual sum of squares error, but the performance of m1 with respect to all the explanatory variables of the model is better than m2 and m3.

Estimates of the demand for money equation under the assumption of static real income (Model III), and hence with current real income included instead of its expected magnitude are presented in table 6.3.

Table 6.3 **FIML Estimates of the Structural Parameters in Model III (equation (6.17)**

Explant. Variables	m1		m2		m3	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
Const.	-4.648	n.c.(a)	-12.648	n.c.	-6.458	n.c.
c_1	0.937	8.445	0.977	10.030	0.958	7.158
b_2	0.855	2.577	0.890	4.238	0.836	2.923
d_1	0.526	3.883	0.315	2.009	0.348	2.507
y_t	1.105	4.761	1.378	1.944	1.183	3.707
r_t	-0.462	1.112	-0.357	0.407	-0.065	0.145
$\dot{p}_t$	-0.010	1.295	-0.023	1.491	-0.013	1.395
D_t	0.118	1.581	0.212	1.250	0.185	1.403
R^{-2}	0.987		0.994		0.995	
DW	1.89		1.96		2.00	
S	0.127		0.096		0.085	

(a) not estimated.
c_1 = autoregressive coefficient.
b_2= the elasticity of expectations of inflation.
d_1 = adjustment coefficient.

The estimated elasticities in Model III (equation (6.17)) show that as a result of including static expectations of income, there is a highly positive autoregressive coefficient, c_1, for all definitions of money. The elasticity of expectations of the rate of inflation, b_2 is not high for m1, m2 and m3.

Actual real money balances adjust to the desired levels more slowly than in equation (6.14) and (6.16). This may be interpreted as saying that the expectations of price changes have a limited role in adjusting actual real money balances to their desired level. The other elasticities do not vary from those estimated in tables 6.1 and 6.2, so it could be argued that the present specification of the demand for money function is stable.

To sum up these empirical results, it seems that the elasticity of income does vary according to the specification of the demand for money function. However, elasticities of interest rate and rate of inflation do not vary widely among various specifications of the demand for money function. In general, the broad money variables, m2 and m3, were not significantly affected by the rate of interest during the considered period. In contrast, the narrow money variable, m1, was influenced by both interest rates and the rate of inflation, as their coefficients are significantly different from zero at the 10 percent level. Estimates of income expectations and adjustment do not vary in equations (6.14) and (6.16). This implies that the specification of the demand for money function with expected income is superior to that with expected inflation and static income.

The assumption that both income and inflation rate are static, i.e. $b_1 = b_2 = 1$, are now considered so the demand for real money balances in model IV (equation (6.18) is related to the current real income, the current interest rates and the current rates of inflation. OLS estimates of parameters in equation (6.18) are presented in table 6.4.

Table 6.4: OLS Estimates of Parameters in Model IV (equation (18)

Independent Variables	m1		m2		m3	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
Constant	-2.578	3.709	-2.299	3.387	-1.977	2.911
y_t	0.541	3.894	0.429	4.039	0.429	4.197
r_t	-0.211	2.053	-0.082	0.735	-0.013	0.117
$\dot{p}_t$	-0.005	1.268	-0.006	1.702	-0.004	1.180
m_{t-1}	0.766	5.398	0.841	8.960	0.786	8.761
R^{-2}	0.991		0.994		0.994	
DW	1.33		1.06		0.93	
S	0.125		0.117		0.115	

The estimated parameters in the table above show the correct signs for the three definitions of money, m1,m2 and m3. The lagged real money balance term is highly significant as an explanatory variable in the demand for money function. The real income coefficient is positive, and significant at the 1 percent level for m1, m2 and m3. As estimated by FIML in the distributed lag specification of the the demand for money function, the coefficients of the rate of interest and the rate of inflation have the expected signs for all definitions of money, but the former is significant for m1 only and the latter is significant at 10 percent level for m1, m2 and m3. However, when the demand for real money function is estimated under the assumptions of equation (6.19), i.e. $b_1 = 1$, $b_2 = 1$ and $d_1 = 1$, the estimated parameters were quite different as table 6.5 shows below.

Table 6.5: OLS Estimates of Parameters in Model V (equation (6.19)

Independent Variables	m1 Coeff.	m1 t-value	m2 Coeff.	m2 t-value	m3 Coeff.	m3 t-value
Constant	-1.273	1.509	-0.755	0.703	-0.327	0.312
y_t	0.984	8.532	0.874	5.937	0.822	5.745
r_t	0.135	1.113	0.602	3.896	0.672	4.473
$\dot{p}_t$	0.009	2.087	0.011	2.010	0.011	2.007
R^{-2}	0.979		0.981		0.983	
DW	1.09		0.87		0.81	
S	0.276		0.449		0.425	

According to the estimated parameters in table 6.5, it can be argued that as a result of the exclusion of lags, both coefficients of the interest rate and the rate of inflation have had the wrong signs, but the elasticity of income is highly significant with the expected sign for m1, m2 and m3. However, there is still a serial correlation problem.

It is apparent that the interest rate and the rate of inflation have not significantly affected the demand for real money balances, except for m1 as shown in table 6.4. Therefore, the demand for real money balances is specified as a function of the expected real income only, in which the assumption of the adjustment mechanism inherent in equation (6.20). FIML estimates of the structural parameters of this equation are presented in table 6.6.

<u>Table 6.6</u>: FIML Estimates of the Structural Parameters in Model VI (equation (6.20)

Explan.	m1		m2		m3	
Variables	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
const.	-8.886	n.c.(a)	-8.238	n.c.	-8.323	n.c.
c_1	0.326	0.853	0.155	0.493	0.305	0.909
b_1	0.712	14.002	0.550	15.646	0.549	15.288
d_1	0.762	2.155	0.509	1.888	0.534	1.897
y_t	1.232	14.006	1.675	4.853	1.694	14.816
$\bar{R}^2$	0.989		0.994		0.995	
DW	1.87		1.98		1.97	
S	0.124		0.104		0.086	

(a) not estimated.
c_1 = autoregressive coefficient.
b_1 = the elasticity of expectations of income.
d_1 = adjustment coefficient.

It can be seen from the estimated elasticities in table 6.6 that the income elasticity and the elasticity of income expectations are very highly significant. Furthermore, the income elasticity is in the range of that estimated in the case of LDCs, and similar to Crockett and Evans' estimates for Egypt. The existence of an autocorrelated error term is not apparent, as shown by estimates of the three definitions of money. The estimates of the adjustment elasticities are .76, .51 and .53 for m1, m2 and m3, respectively. These imply that the actual broad money balances adjust to the desired levels slower than the narrow money balances, which could be due to the exclusion of the inflation expectation term. However, it is apparent that the demand for money specification in table 6.6 is preferred to the others, but it ignores the impact of both interest rate and rate of inflation on money demand.

The stock adjustment mechanism, however, has been criticized. Thomas (1987, p. 29) argues that despite the attractiveness of the stock adjustment model, it is an "ad hoc" method of explaining the importance of lagged variables in the estimated demand equation. However, in the above demand for money function we applied not only the stock adjustment mechanism, but also adaptive expectation and auotoregressive mechanisms, which have not been considered previously for Egypt, as shown above. Even so, this kind of demand for money function is still open to criticisms.

In the 1970s the empirical relationships estimated under the conventional demand for money function revealed parameter instability in the U.K. (Artis and Lewis, 1976), and poor forecasting for the US demand for M1 in the 1970s (Goldfeld, 1973). Furthermore, Gordon (1984) points out some further empirical inertia, which is related to a large coefficient on the lagged dependent variable and a problem of significant serial correlation. However, serial correlation is only absent, as shown by the autoregrssive coefficients above, in the general model (model I) and in the very limited model (model IV). Nevertheless, the demand for money studies moved towards a new dynamic modelling of the demand for money function in developed countries. This is the error correction model, to which we turn next.

6.6 THE DEMAND FOR MONEY: AN ERROR CORRECTION MODEL

Hendry and Mizon (1978) and Hendry (1979) have criticised imposing a priori restrictions on the lag structure of the predetermined variables or on the error term dynamics. They developed the error correction model, which has been developed under the" general-to-the specific" approach to modelling of dynamic time series.[12] This approach was first applied to the UK consumption function (Davidson et al, 1978). The key element of this approach is to consider a general autoregressive-distributed lag (ADL) model.[13] The model is then reparameterized (or simplified) to yield a reduced form equation (an error correction mechanism) to include variables that are economically and statistically acceptable. The simplified equation encompasses difference variables as well as an error feedback term. The former determines the short-run adjustment around the long-run equilibrium, which is captured by the level terms, including the error correction term.

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[12] See Hendry (1979) for the specification of such a model under the modelling methodology of " the General to Specific ".

[13] Hendry (1978) has chosen a maximum lag of four periods for quarterly data.

The error correction model has been developed and successfully applied in modelling the demand for narrow (M1) money in developed countries.[14] Applications to developing countries, however, remain few, and there are none on Egypt.[15] Unlike the error correction model of the demand for money in developed countries, developing countries' studies included the exchange rate to capture the opportunity cost of holding foreign exchange as a substitution for domestic real balances. However, changes in exchange rate (depreciation or appreciation) would affect the demand for real cash balances as long as they are a good indicator of price changes (see Cagan, 1956, pp.90-91). It has been shown that the Egyptian pound has experienced several devaluations during the study period. Whether such devaluations in exchange rate have affected the real demand for money or not is to be tested by including the exchange rate as an explanatory variable in the following equation for demand for real cash balances:

$$\ln\left(\frac{M}{p}\right)_t = a_o + a_1 \ln y_t + a_2 \ln r_t + a_3 \ln p^{\cdot}_t + a_4 \ln er_t + u_t \qquad (6.21)$$

Above er is the exchange rate of Egyptian pound per unit of the US dollar (official rate), and variables y_t, r_t and $p_{\cdot}$ are as defined as in the preceding model. Equation (6.21), may

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[14] See, for example, Hendry (1979, 1985) and Muscatelli (1989) for the UK and Gordon (1984) for the US.

[15] Empirical error correction models in LDCs are studied by Arestis (1988) for Mauritius, Malta and Cyprus, by Domowitz and Elbadawi (1987) for Sudan, by Gupta and Moazzami (1990) for Eleven Asian countries, and Simmons (1990) for five African countries.

then be reparameterized to yield the following error factor equation (EFE), (see Cuthbertson, 1985, pp. 266-267):

$$d \ln(\frac{M}{p})_t = b_o + b_1 \, d \ln y_t + b_2 \, d \ln r_t + b_3 \, d \ln p_t +$$
$$b_4 \, d\ln er_t + b_5 \ln (\frac{M}{py})_{t-1} + b_6 \ln y_{t-1} +$$
$$b_7 \, d^2 \ln p_t + b_8 \ln er_{t-1} + b_9 \ln r_{t-1} +$$
$$b_{10} \, d\ln (\frac{M}{p})_{t-1} + u_t \qquad (6.22)$$

It can be seen that equation (6.22) contains variables as differences,and also retains the variables that determine the long-run equilibrium, such as the error term, $(M/py)_{t-1}$, and y. In this equation, also the maximum lag is set to two periods to avoid losing degrees of freedom because we employ annual data. The expected signs of parameter estimates are as follows: $b_1 > 0$, $B_2 < 0$, $b_3 < 0$, $b_4 < 0$, $b_5 < 0$, $b_6 > 0$, $b_7 < 0$, $b_8 < 0$, $b_9 < 0$, and $b_{10} > 0$.

The coefficient on the change in exchange rate, b_4, is expected to be negative, or depends on how exchange rate is defined. For example, while Arestis (1988) expected and obtained a negative coefficient for his three LDCs, Domowitz and Elbadawi (1987) estimated a positive one for Sudan.

6.7 EMPIRICAL RESULTS OF THE ERROR CORRECTION MODEL

Table 6.10 presents the OLS estimates of the parameters in equation (6.22) for the three definitions of money, i.e. m1, m2, and m3.

Table 6.7: OLS Estimates of Parameters in the Unrestricted Error Correction Model (Equation (6.22)

Independent Variables	d(M1/p)		d(M2/p)		d(M3/p)	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
Constant	-2.667	2.747	-1.944	2.500	-1.933	2.492
$dlny_t$	0.852	4.745	0.605	3.928	0.569	3.912
lnr_t	-0.267	1.879	-0.136	1.049	-0.069	0.552
lnp_t	-0.010	1.879	-0.010	2.026	-0.009	2.011
$lner_t$	-0.179	1.369	-0.107	0.916	-0.057	0.496
$d(M/pY)_{t-1}$	-0.347	2.054	-0.118	0.815	-0.109	1.026
lny_{t-1}	0.198	1.582	0.213	1.879	0.236	2.228
$d^2 lnp_t$	-0.003	0.906	-0.004	1.080	-0.002	0.492
$lner_{t-1}$	-0.129	0.898	-0.063	0.490	0.046	0.379
lnr_{t-1}	0.043	0.266	-0.038	0.273	-0.080	0.575
$dln(M/p)_{t-1}$	0.556	2.638	0.586	3.045	0.487	2.686
D_t	-0.048	1.461	-0.024	0.780	-0.024	0.706
R^2	0.509		0.600		0.602	
DW	1.879		1.880		1.782	
h	0.355		0.344		0.626	
n	33		33		33	

R^2 is adjusted for the degrees of freedom.
h denotes Durbin-h statistic.

All the estimated coefficients on the differenced variables exhibit the expected signs. However, not all the parameters are significant. The coefficient on income is significant at 1 percent level for m1, m2, and m3, the parameters on interest rates are significant at 10 percent level only for the narrow money (M1), while those on exchange rate are not significant. The most important result is that the error term, $(m/pY)_{t-1}$, has the expected sign for the three definitions of money, but is only significant at 5 percent level for the narrow money (M1). The lagged dependent variable and lagged real income have the correct signs, and are significant at 5 percent level for the lagged dependent variable, but the lagged income coefficient is only significant at 5 percent level for the broad money (M3). This implies that unlike the preceding stock adjustment and expectation model and El- Shiekh findings, lags affect the broad money slightly more than the narrow money.

As regards the other lagged variables in levels, it seems that they are not all significantly different from zero for the three definitions of money. Furthermore, the lagged interest rates and exchange rate demonstrate the wrong signs for m1 and m3, respectively. The equation, was also estimated with a dummy variable, D_t, to capture wars' effects on the demand for money. Results show that wars affected the demand for money negatively, but only at 10 percent significant level for m1. Finally, the determination coefficient is not very high for m1. However, a high R^{-2} is not a precondition for a good specification, especially since in other studies a similar estimation for R^{-2} was obtained, e.g. Hendry (1979, p.237, eq.19) obtained R^{-2} = .48 for m1 in the UK, and for Sudan Domowitz and Elbadawi (1987) have estimated a slightly higher goodness-of-fit for m1,i.e. .57.

Nevertheless, the insignificant coefficients on the lagged variables, and also the need for parsimony suggest simplification of eq. (6.22) by imposing identical coefficients to economize on parameters (Hendry (1979, p. 235), and also to gain degrees of freedom. The restrictions imposed vary among the three definitions of money, and they are only chosen to be data-acceptable and because they are not significant. For m1 and m2, the restrictions imposed are $b_4 = b_7 = b_8 = b_9 = 0$, and for m3, those restrictions imposed on m1 and m2 plus $b_3 = 0$. The OLS estimates of the restricted equations are presented in table 6.8.

Results in table 6.8 below show that the restrictions have not lowered either the standard error, SE, or the determination coefficient, R^{-2}, but the t-values increased for the narrow definition of money, m1. On the other hand, where SE has been lowered, R^{-2} has been increased for m2 and m3. Furthermore, F is significant at 5 percent level for m1, m2, and m3. Also LM statistic for the Lagrange Multiplier test shows no sign of serial correlation up to third-order at 5 percent level. Also, error correction coefficients are all significant at 5 percent level. Thus, the restricted equations are superior to the unrestricted equations. The long-run income elasticity is 1.594 for the narrow money, m1, and 2.553 and 2.415 for m2 and m3, respectively. Thus, this long-run income elasticity is lower and more plausible than that estimated in the stock adjustment and expectations model, especially for m1.

Table 6.8: OLS Estimates of the Restricted Equations

Dependent variables	d(M1/p)		d(M2/p)		d(M3/p)	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
Constant	-2.216	4.535	-2.249	4.718	-1.871	4.075
$dlny_t$	0.791	4.720	0.542	4.068	0.502	4.108
$dlnr_t$	-0.294	2.400	-0.131	1.309	-	-
$dlnp_t$	-0.013	3.461	-0.014	4.587	-0.010	3.764
$ln(M/pY)_{t-1}$	-0.362	2.665	-0.161	2.202	-0.147	2.091
lny_{t-1}	0.212	4.528	0.250	4.989	0.208	4.247
$dln(M/p)_{t-1}$	0.535	3.334	0.433	3.062	0.423	3.099
D_t	-0.048	1.494	-0.044	1.553	-0.028	1.029
R^2	0.508		0.632		0.651	
SE	0.081		0.047		0.46	
DW	1.976		1.861		1.974	
$F^*(v1,v2)$	0.967		0.470		0.312	
LM (3)	2.884		2.661		1.661	

F^* is the estimated F for the validity of the restriction at v1 and v2 degrees of freedom (3,21) for m1, (4,21) for m2 and (5,21)for m3. Where v1 is the number of restrictions and v2 = (n-k), where n is number of observations in the unrestricted equation and k is the number of parameters.

In a tentative comparison between the two models that have been applied to the demand for real cash balances in Egypt over the 1952-86 period, it seems that the performance of all the predetermined variables is better under the error correction model than under the stock adjustment-expectations model. However, the latter could give better results if estimated with quarterly data to allow for longer lag structure, and the former does not deal explicitly with expectations. Finally, estimates of the two models indicate that the narrow money (M1) equation is superior to the broad money specification (M2, M3). Additionally, in the next two sections the stability of the two models and their abilities to predict the value of the real cash balance inside the study period are examined.

6.8 STABILITY TESTS FOR THE DEMAND FOR MONEY FUNCTION

It has been discussed above that the Egyptian economy has experienced several economic and institutional as well as some external shocks, e.g. wars, over the sample period, 1952-86. The question is: does the relationship between real money balances and the explanatory variables exhibit stability over the sample period despite these shocks.

In an attempt to answer this question we have estimated the Chow-test for parameter stability. Since there have been several transitional periods during the sample period, the whole period is divided into two equal sub-periods: 1955-1970 and 1971- 1986 for the stock adjustment and expectations model, where the equation with one expected exogenous variable is used in estimating the F-ratio. For the error correction model the two sub-periods are 1953-69 and 1970-1986. However, it is to be noted that the second sub-period has witnessed the early preparation and launching of the open door economic policy in 1974, and hence it could be considered as a transition from previous controlled economy to a liberalized one.

The Chow-test (Chow, 1960) for the demand for money function in the two models was estimated by calculating the F^*-ratio for the two models using the following formula:

$$F^*\text{-ratio} = \frac{[\ SSR_n - (\ SSR_1 + \ SSR_2\ )]}{(SSR_1 + \ SSR_2\ )/(n_1+n_2- 2k)}$$

Where:

SSR_n = the sum of squared residual for the whole period.

SSR_1 = " " " " " for the first sub-period.

SSR_2 = the sum of squared residual for the second sub-period.

n_1 = the number of observations of the first sub-period.

n_2 = " " " " " " second " " .

k = the number of the coefficients.

If the function is to be stable F^*-ratio should be less than the statistic derived from the F-distribution. Thus, the estimated F^*-ratios are presented in table (6.9).

Table 6.9: The Chow-Test of Parameter Stability (The Estimated F^*-ratio)

dependent variable	Stock-Adj.(a) F(12,8)(d)	Stock-Adj.(b) F(12,8)	Error correction F(c)
M1	0.805	2.253	2.053
M2	0.519	2.266	1.635
M3	0.658	1.635	1.516

(a) The stock-adjustment model with static inflation expectations.
(b) The stock-asdjustment model with static income expectations.
(c) The critical F-ratios are ,m1(9,16)= 2,54, m2(8,18)= 2.51 and m3(7,20)= 2.52.
(d) F(12,8)= 3.28.

It can be seen that the estimated value of F-ratios for all definitions of money in the two models are less than the critical value of F-distribution. Consequently,all the functions are stable, but as has been mentioned above the stock adjustment model with expected income is superior to that with current income and expected inflation.

6.9 SIMULATION RESULTS

In order to test the ability of the estimated model to track the behaviour of real money balances, the two main models were simulated over the study period, 1952-86. As the stock adjustment model with static expectations for inflation is superior to that with static income expectations, the former only was simulated. The actual and predicted logarithmic value of real money stock in model II (eq.(6.16) are shown in figures 6.1 a, 6.1 b, and 6.1 c for m1, m2, and m3 respectively. From the three figures the demand for money equation seems to forecast the observed value reasonably well.

Furthermore, table (6.10) presents the root mean squared error and Theil's inequality coefficient (U), which measures the accuracy of the simulation.

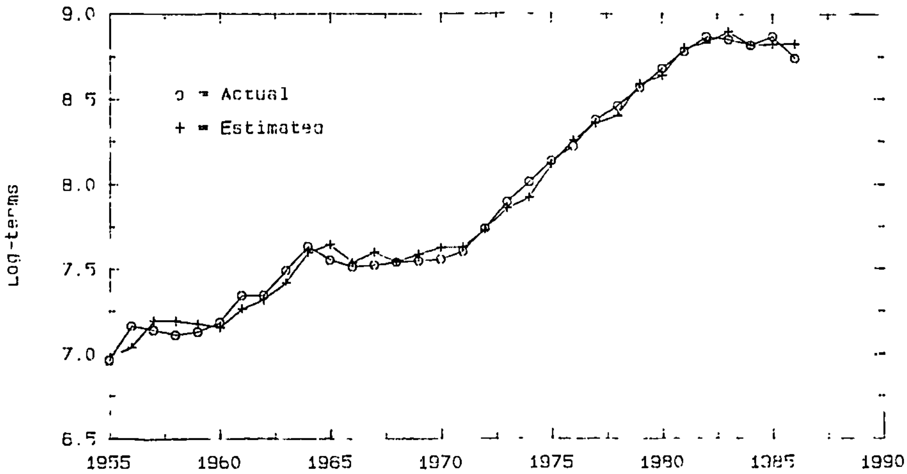

Figure 6.1 a: Actual and Estimated level of Real Demand for Money (M1) in the Stock Adjustment-Adaptive Expectations Model.

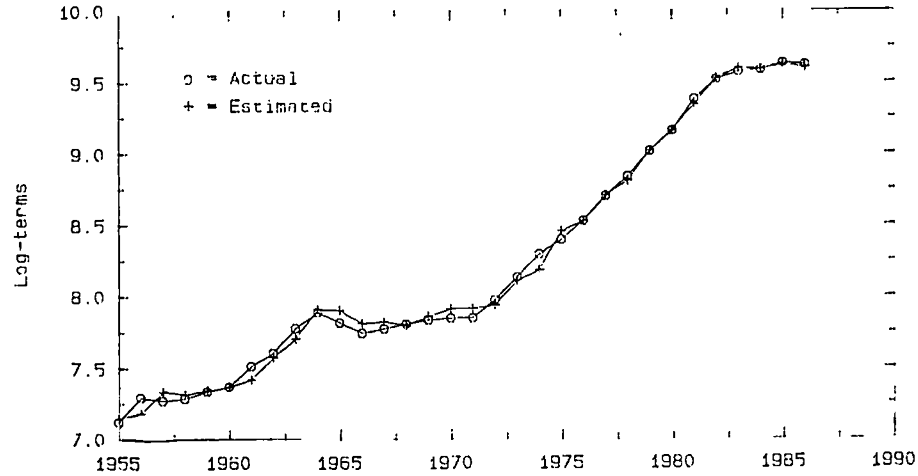

Figure 6.1 b: Actual and Estimated Level of Real Demand for Money (M2) in the Stock Adjustment-Adaptive Expectations Model.

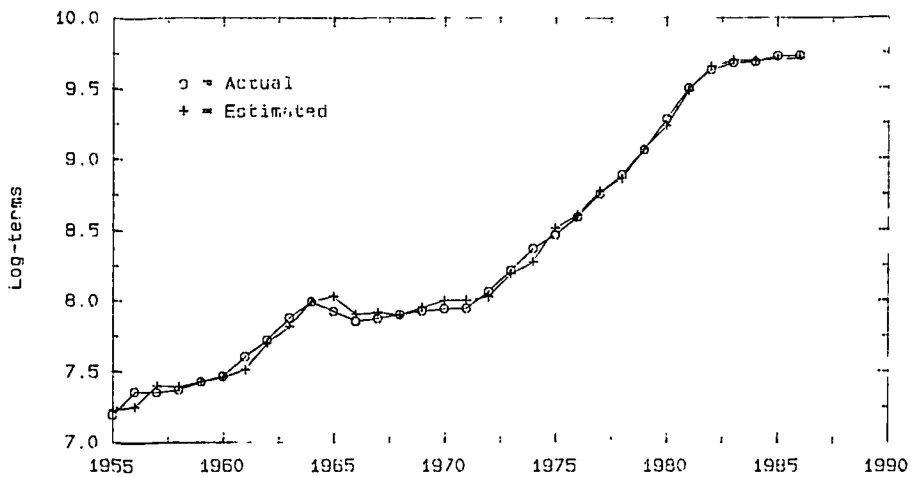

Figure 6.1 c: Actual and Estimated Level of Real Demand for Money (M3) in the Stock Adjustment- Adaptive Expectations Model.

Table 6.10: **Simulation Diagnostics of the Demand for Money Eq.(6.16),(Stock Adjustment-Expectations Model)**

Diagnostics	M1	M2	M3
1.Root mean squared error	0.049	0.044	0.044
2.Mean error	2.0 E-6	3.0 E-5	4.0 E-6
3.Theil's Inequality Coefficient(U)	4.0 E-5	3.0 E-5	3.0 E-5
Theil's partial Inequality Proportion Coefficients:			
i) Bias proportion (U^m)	1.0 E-9	4.0 E-9	8.0 E-9
ii)VarianceProportion (U^s)	0.002	0.001	0.001
iii) Covariance proportion(U^c)	0.998	0.999	0.999

Theil's inequality coefficient, U, lies between zero and 1. Where a value of unity indicates no correspondence between the actual and the predicted values of the dependent variable, a zero value indicates a perfect correspondence (see Theil, 1966). As a consequence, the closer the value of U to zero the more accurate the tracking behaviour of the model to be. Additionally, table (6.10) contains a decomposition of the U into three inequality proportions, U^m, U^s, and U^c. The value of U^m and U^s should be as close to zero as possible and the U^c close to unity. In other words, the value of the three proportions should be unity. The value of these three proportions as they have been shown in the table above are all satisfactory as well as the U and the root mean squared errors.

Now the simulation results of the error correction model are presented. Firstly, the actual and predicted values of the change in (the logarithms of) real cash balances for m1, m2, and m3 are shown in figures 6.2 a,6.2 b, and 6.2 c, respectively. It seems that the model tracks the historical behaviour of the actual change in the real money stock reasonably well, although some turning points are missed. Secondly, table (6.11) presents the root mean squared errors and the Theil's inequality coefficient, U, as well as the decomposition of U, as shown in table (6.10) above, for the error correction model.

Table 6.11: Simulation Diagnostic of the Demand for Real Cash Balances (The Error Correction Model)

Diagnostics	dM1	dM2	dM3
1.Root mean squared errors	0.048	0.042	0.041
2.mean error	4.0 E-7	1.0 E-7	4.0 E-7
3.Theil's inequality coefficient(U)	0.2576	0.148	0.144
Theil's partial inequality Proportion coefficients:			
i) Biasproportion (U^m)	7.0 E-11	6.0 E-11	9.0 E-11
ii) Variance proportion(U^s)	0.116	0.085	0.084
iii)Covariance proportion(U^c)	0.884	0.915	0.916

It can be seen from the table above that the value of the three proportions of the Theil's inequality coefficient is satisfactory along with the root mean squared errors. Although, the simulation diagnostics for the stock adjustment-expectations model are more satisfactory, the performance of the error correction model in the present study is better than that applied for some developing countries (see Arestis, 1988).

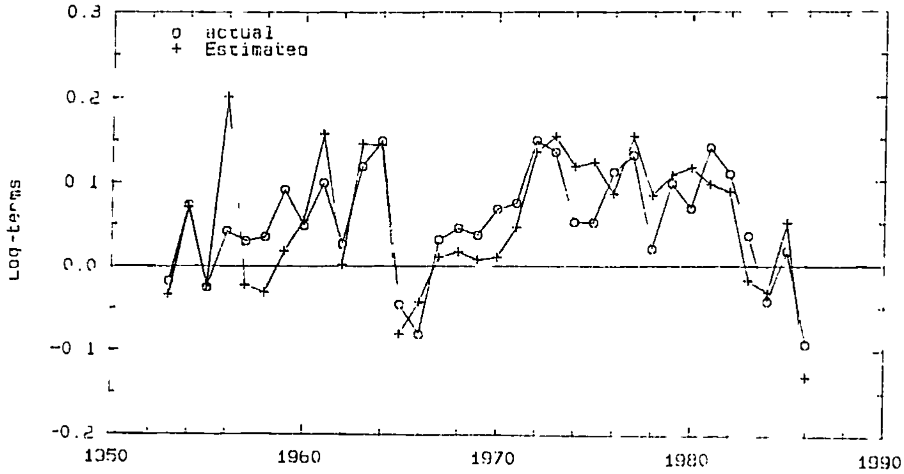

Figure 6.2 a: **Actual and Estimated Change in the Demand For Money (M1): The Error Correction Model.**

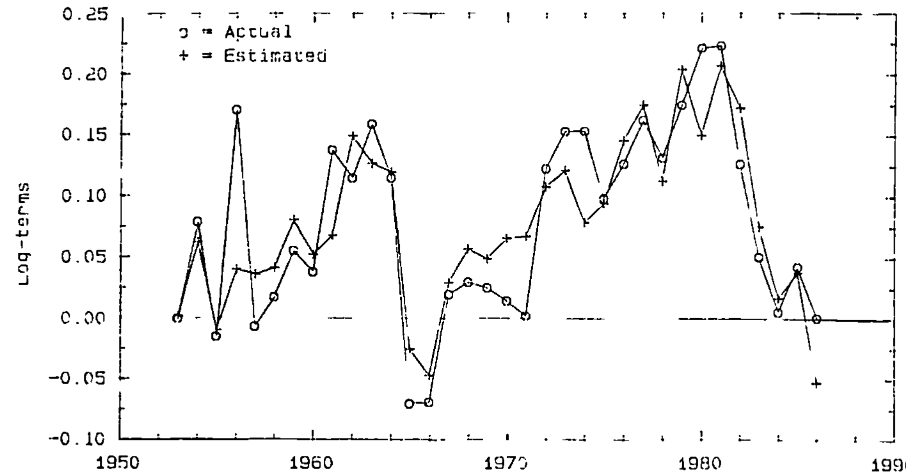

Figure 6.2 b: **Actual and Estimated Change in the Demand for Money (M2): The Error Correction Model.**

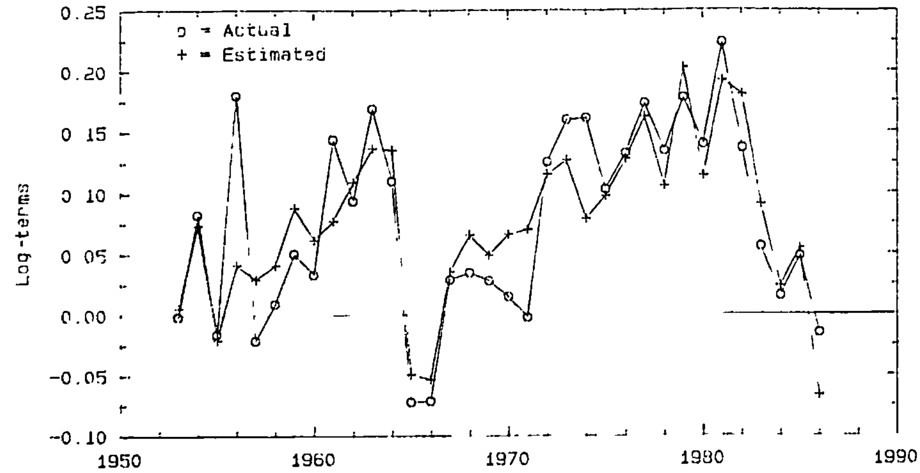

Figure 6.2 c: **Actual and Estimated Change in the Demand for Money (M3): the Error Correction Model.**

6.10 CONCLUSIONS

The purpose of this chapter was to examine the stability of the demand for money function in Egypt over the 1952-86 period. In order to do so two distributed lag models have been developed and estimated. The first is the stock adjustment-expectations model, which had been mostly used in the 1960s and the 1970s to examine demand for money functions. The second is the most recent model successfully applied in developed countries and in a few developing countries, i.e. the error correction model.

For the first model type, the performance of the explanatory variables does not appear very convincing (see table 6.1). This may be due to the long lag structure used with annual data; therefore, the performance of the model could be improved if quarterly data is used. On the other hand, alternative versions of this model have been estimated to reduce the lag structure. It seems that the best versions are model II which includes the expected income and the current interest and inflation rates as explanatory variables, and model VI in which the expected income is the only explanatory variable. This implies that income is the main determinant of the demand for money in Egypt. This may also justify the high income coefficients obtained, which in turn implies that monetary expansion in Egypt may lead to a less proportionate increase in prices. This is to be considered in the next chapter.

On the other hand, expectations appear to effect the demand for real narrow money, as elasticities of expectations of income and inflation are significant for the narrow money (m1). However, inflation appears not to have any influence on the demand for money in the stock adjustment- expectation model. On the contrary, estimates of the error correction model indicate that inflation has significantly affected the demand for the three definitions of money, M1, M2. and M3

The stability tests have shown that both models are stable over the study period. Furthermore, the simulations of the two models have shown their ability to track the behaviour of real money balances during the sample period reasonably well. Thus, the main conclusion is that the demand for money in Egypt is stable, and hence it is consistent with the Fund approach assumption of a stable demand for money function, although the presumption in this chapter has been for endogeneity of money supply with some role for interest rate in the demand for narrow money and both features contrast with Fund specifications.

CHAPTER 7

THE EGYPTIAN INFLATION PROBLEM

7.1 INTRODUCTION

According to the IMF approach, inflation is a monetary phenomenon caused by an excess supply of money. The main concern of this chapter is to examine the causes of inflation in a small open economy, namely Egypt. In order to do this, the IMF assumption that money supply is exogenous is followed. Generally, inflation as an economic phenomenon has been intensively investigated, theoretically and empirically, in the economic literature.

The historical evolution of theories that explain inflation is beyond the scope of the present study.[1] However, based on the origins of inflation, theories that explain inflation can be briefly divided,according to Surrey (1989), into three main kinds.

The first is pure monetary theory, in which inflation is

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[1] For a survey of literature on theories that explain inflation,see for example, Johnson(1967), Laidler and Parkin (1975), Zis (1976), Jackman, Mulvey and Trevithick (1982), and Teleb (1985).

fundamentally a monetary phenomenon, as Friedman points out: **"inflation is always and everywhere a monetary phenomenon ... and can be produced only by a more rapid increase in the quantity of money than in output"** (Friedman, 1970, p. 24).

The second category is the cost-push theory. The third is external theory, which can be split into; i) theories of imported inflation via import prices, and ii) theories of inflation that stress the impact of exchange rate devaluation.

These theories, however, have originated in the economic and institutional structure of developed industrial countries. An application of such theories to developing countries has been a subject of controversy between two groups of economists in Latin America, namely structuralists and monetarists.[2]

Inflation in most developing countries has been examined mainly within a monetary framework, structural framework, and sometimes an eclectic framework in which monetary, cost-push and structural variables are included. These three frameworks, and their previous application to inflation in Egypt as well as developing countries in general are to be examined. Thus, section 7.2 discusses the monetary approach to inflation in developing countries. The structural approach is examined in

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[2] For an excellent survey of this controversy, see Kirkpatrick and Nixson (1976).

section 7.3. Section 7.4 examines trends of inflation and reviews the previous empirical evidence on inflation in Egypt, and also presents new evidence of the estimation of the conventional monetary and structural theory of inflation for Egypt over the study period, 1952-1986. Section 7.5 develops a broad model of inflation that includes monetary, structural and expectation factors, and regression estimates of this model in Egypt. Section 7.6 develops a monetary model of inflation in a small open economy and presents results of estimating this model for Egypt. Conclusions are outlined in section 7.7.

7.2 MONETARY THEORY OF INFLATION IN LDCs: THEORY AND EMPIRICAL EVIDENCE

It is likely that the monetary explanation of inflation has received the most attention in analyzing inflation in developing countries. In this context, it seems that the most influential model is that provided by Harberger (1963). In his study of inflation in Chile, Harberger derives his model of inflation by assuming the following conventional demand for money function:

$$M^d = f(p, y, A) \tag{7.1}$$

Where:

M^d = the nominal demand for money.

p = the price level.

y = the level of real output.

A = the cost of holding money.

The supply of money is assumed to be determined exogenously. Thus, in equilibrium,given the level of real income and the cost of holding money, the price level will adjust to equate the demand for money to an existing supply. Consequently, the price level is specified as a function of the quantity of money, M_t, the level of real income, y_t, and the cost of holding money, A_t. It is also assumed that the effects of increases in the money supply on the price level occur over time, so that money supply is introduced in the price equation in the form of a distributed lag. Thus, the price equation can be expressed as follows:

$$p_t = f(y_t, M_t, M_{t-1}, A_t) \tag{7.2}$$

Since Harberger is interested in analyzing the rate of inflation rather than the price level, equation (7.2) can be expressed in rate of change:

$$\dot{p}_t = a_0 + a_1 \dot{y}_t + a_2 \dot{M}_t + a_3 \dot{M}_{t-1} + a_4 \dot{A}_t + u_t \tag{7.3}$$

A dot over the variables denotes the proportional of change. Thus, the inflation rate is expressed as a function of the rate of change in real income, the rate of change in the quantity of money in the present and previous period, and the rate of change in the cost of holding money, measured by a proxy of the expected inflation rate, which is taken as the change in past inflation rate, i.e. $(p_t - p_{t-1})$.

According to Harberger the coefficient of the change in the real income is expected to be not significantly different from -1. This implies that,ceteris paribus, a one percent increase in real income will induce a fall of one percent in the price level. The sum of the coefficients of M_t and M_{t-1} is expected to be positive and insignificantly different from unity. This indicates that, other things are equal, a given a percentage increase in the stock of money will induce a similar percent increase in the price level. The parameter of the cost of holding money is expected to be positive.

Using quarterly and annual data over the period 1939-58, Harberger estimated equation (7.3) with and without the cost of holding money and equation (7.3) adding the rate of change in wage rate, as an explanatory variable to capture the effect of changes in wages on the price level, for the consumer price index and wholesale price index and their components. His regression results show that each variable is significant and has the expected sign. However, adding the rate of change in wages to the equation adds nothing to the explanatory power of the model, but reduces the significance of the cost of holding money variable. The determination factor measured by R^{-2} is high for the annual regressions, i.e. 0.87. However, the sum of the money supply coefficients is not significantly different from one, while the real income coefficient is not significantly different from minus one.

The Harberger model of inflation has been the basis for most studies of the determinants of inflation in Latin American countries. For example, Diaz-Alejandro (1965) has employed the Harberger model to the inflation in Argentina, Diz (1970) for Argentina, Vogel (1974) for sixteen Latin American countries. A revision of Vogel's results with division of the sixteen countries into three groups; high, medium and low inflation is undertaken by Bentancourt (1976) and Sheehey (1980). Also, unlike the above studies, Holden and Peel (1979) applied the Harberger model, to eight Latin American countries. Using an explicit adjustment mechanism for the stock of money. The general conclusions of these studies indicate that the Harberger monetary model is appropriate in explaining inflation in Latin America.[3]

The Harberger model has been extended to other countries outside Latin America. Bhalla (1981) has estimated the basic Harberger model for a group of 30 developing countries, Egypt included, using annual data for the period 1956-75. Despite the diversity amongst the countries studied, results for individual countries,

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[3] Also see Karatzas (1981) for inflationary forces in 45 countries in the 1970s.

in terms of the adjusted factor of determination, R^{-2}, show the model performs remarkably well. Except for Korea, the adjustment coefficients of determination, R^{-2}, are high, and the parameters of the variables have the expected signs. The coefficient of M_t is always greater than that of M_{t-1}, implying that current changes in the money supply have a greater impact than lagged changes. The sum of the coefficients of M_t and M_{t-1} is significant for twenty-five countries. For eleven of these countries the sum is not significantly different from one. The coefficient of income is negative and significant for eleven countries, and is not significantly different from -1 for nine countries. The coefficient of the cost of holding money shows the correct sign in most countries, but it is significant for only ten countries.

Bhalla also estimated the model using pooled data for 28 countries over the period 1971-75. The estimated coefficients have the correct signs, and are significant. Thus, Bhalla's results for both individual countries and cross section data support the monetarist view of inflation in these developing countries.

However, the monetarist model has proven unsuccessful in explaining inflationary pressures elsewhere. Saini (1982) estimated the Harberger model,using annual data, for six Asian countries, including low and moderate inflation countries.[4] Regression results show that the monetarist model does not successfully explain the behaviour of inflation in his sample of six Asian countries. For example in the case of Korea R^{-2} is very low, and the coefficient of M_t is not statistically significant in any of the six countries, and this coefficient in Taiwan is close to zero and has the wrong sign in India and South Korea. The failure of the monetarist model to explain determinants of inflation in these countries in this study may be attributed to the monetization of these countries, on the one hand, and to the exclusion of other domestic and external factors of inflation, on the other.

Similarly, London (1989) has estimated the Harberger model for 23 African countries using both pooled data for the period 1974-85 and subperiods, and annual data for individual countries over various periods. On the basis of his regression results, London concludes that the monetary model of inflation seems to hold when empirically tested in cross-section covering long periods, and in some cases for high inflation countries. However, other variables appear to have an important role in determining the rate of inflation in Africa. Exchange rate changes and imported inflation (measured by the U.S. CPI) are shown to be

[4] Annual data cover the periods, 1953-80 for India, Philippine (1953-80), South Korea (1956-80), Sri Lanka (1955-80), Taiwan (1955-80), and Thailand (1954-80). He also used the narrowly and broadly defined money, m1 and m2, respectively, but the results with m1 only reported.

particularly important.

The Harberger model, however, has proven successful in explaining inflation elsewhere in Africa. Darrat (1986 b) estimated the monetarist model of inflation for three developing countries in North Africa, using quarterly data for the period 1960 through 1980.[5] Darrat includes two variables for the cost of holding money balances: expected rate of inflation, $p^{\cdot e}$, to measure the yield forgone on real assets,and expected interest rate (measured by foreign interest rates) to measure the yield forgone on financial assets. He also utilizes an unconstrained Almon polynomial lag structure for each explanatory variable in each country. Darrat takes his study a step forward ahead of all the above studies by performing a Granger-type causality test between money supply and prices. The empirical results of this test for the three countries appear to support the monetary hypothesis, in that causality is running from money supply to prices without significant feedbacks for all the three countries.

Tegene (1989 b) estimated a monetary model, similar to that used by Darrat (1986 b), for six African countries, using quarterly data for the period 1960-1983.[6] On the basis of his results,

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[5] The countries are Morocco, Tunisia and Libya.

[6] The countries are Egypt, Ghana, Morocco, Nigeria, Sudan and Tunisia.

Tegene concludes that the empirical results taken together do not reject the monetarist view of inflation. The estimated model for five of the six countries, using both Chow and Farley tests, is found to have structural stability. Also, the results of Granger-causality tests seem to show causality from money supply to inflation without significant feedback in all six countries.

To sum up, according to the empirical evidence reviewed above, it is difficult to conclude that the monetary model can explain inflation in all developing countries. However, this empirical evidence seems to support the hypothesis that the monetary model is a long-run model, as the results for quarterly data, generally estimated over longer periods, are better than those from annual data. Moreover, most of the above studies treated the money supply as exogenous, which has been strongly criticised in chapters 5 and 6, above. An alternative approach sees inflation as a structural phenomenon, as examined by some researchers in Latin America. The main elements of the structuralist approach to inflation are discussed below.

7.3 THE STRUCTURALIST APPROACH TO INFLATION

The structuralist approach to inflation was first developed in the 1950s in Chile, and the hypothesis has been applied throughout Latin America and other developing countries.[7] Structuralists agree that the monetary expansion is a propagating factor in inflation, but they argue that more fundamental "structural" causes are behind the inflationary process. Their arguments also imply that inflation is inevitable with economic development in underdeveloped economies. In this regard, Sunkel points out that "the underlying causes of inflation in underdeveloped countries are to be found in basic economic development problems and in the structural characteristics of the system of production in these countries".[8]

The structuralist analysis is, generally, concerned with the identification and examination of the alleged structural bottlenecks (or constraints). These structural bottlenecks constitute the elements or hypotheses of the structuralist approach to inflation in Latin America. The main hypotheses are taken to be three:

1) Sectoral bottlenecks and the relative prices hypothesis.
2) Downward price rigidities hypothesis.
3) The propagation mechanism.

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[7] for details on the structuralist approach to inflation in Latin America, see Sunkel (1960), Seers (1961), Baer and Kerstenetzkey (1964), Argy (1970), and Wachter (1976). Also for a review of literature, Kirkpatrick and Nixson (1976).

[8] Sunkel (1960), p.108.

These three structural elements can be clarified briefly against the experience of LDCs, especially those in Latin American.[9]

7.3.1 <u>Sectoral bottlenecks</u>:

Latin American structuralists emphasise the link between inflation and economic development,and point to sectoral bottlenecks as the causes of the changes in relative prices, and inflationary pressures. Three sectors, in particular, are regarded as suffering from structural bottlenecks . The bottlenecks in the three sectors and how they generate a change in relative prices are to be elaborated briefly in what follows:

The first bottleneck is the agricultural sector, It is argued that with economic growth and consequent urbanization and industrialization there is increased demand for food and raw materials, but supply of agricultural output is inelastic and cannot respond to the increase in the demand for food. The result is a rise in the relative price of food over time. The inelasticity of the supply of the agricultural sector is mainly attributed to constraints within that sector, in particular the land-tenure system.[10] The latter is taken to be the primary

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[9] For more details on various structural bottlenecks, see Sunkel (1960), Maynard (1961),Olivera (1964), Baer (1967), Argy (1970), and Wachter (1976).

[10] That land-tenure system is dominated by either large non-capitalist latifundios, which are not interested in profit maximization, or minifundios, which are not integrated into the

cause of low investment. Relatively backward production techniques result in low productivity in the agriculture sector. The consequence is an inability to meet rapidly increased food demand, and hence a rise in the relative prices as a result of excess demand for food. The agriculture bottleneck in Egypt is rather different to that in Latin America, as the excess demand for agricultural products results from the low productivity growth in this sector. The latter can be, to a large extent, attributed to the neglect of the agricultural sector as a result of misguided development planning, which focused on industrial development. The low growth of agricultural production tends to increase the price of food, and hence raises the domestic rate of inflation.[11]

The second source of sectoral bottlenecks is in the foreign trade sector: in theory the excess demand for food could be supplied by increased food imports. But, the foreign trade sector is unable to lessen agricultural bottlenecks, because of its own bottlenecks. It is argued that foreign trade bottlenecks arise from the fact that many LDCs experience difficulties in their balance of payments. The balance of payments deficit is largely due to the slow growth of the LDCs exports, which are mainly a few primary commodities, as shown

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large market economy,but operate at a subsistence level.

[11] For more discussion on the effect of agriculture bottleneck on inflation, see Edel (1969).

for Egypt in chapter 2. This slow growth of exports in turn is attributed to a low income elasticity of demand for exports, as shown for Egypt's exports in chapter 4, and to the introduction of synthetic substitutes for such exports. On the other hand, demand for imports is income elastic, especially imports of intermediate and capital goods that are required for industrialization process. The income elasticity of demand for imports in Egypt is found to be higher than unity, see chapter 4. Thus, any attempt to eliminate the balance of payments deficits through either constraining imports, whether by duties or direct controls, or by a devaluation will tend to raise the domestic price of imports or import substitutes relative to the price of other nontraded goods.

The third source of bottlenecks is related to the government sector. It is argued that high rates of industrialization and urbanization have substantially increased the range of necessary government activities, mainly in the form of physical and social infrastructure facilities. In order to increase its revenues to finance infrastructure investment, governments may try to overhaul tax laws, but this may not be feasible in the short-run, as Baer (1967, p. 10) argues that a reform of the tax system is a long-run problem, because in most Latin American countries the tax collecting bureaucracies and elsewhere are "antiquated, inefficient, and sometimes corrupt". The problem is usually met by deficit financing, which increases the inflationary pressures via money supply expansions, which are examined for Egypt in chapter 5.

In addition to the above three sectoral bottlenecks, there are other bottlenecks in individual countries, e.g. Sunkel (1960, p. 115) argues, in the case of the Chilean economy, there have been other bottlenecks in the availability of basic services, such as transport, power, some type of skilled labour, certain raw materials, and intermediate goods.

7.3.2 Downward Price Rigidities

The structuralists argue that changes in relative prices affect the general price level. The overall price level, however, does not have to rise after the increase in the relative prices of food and imported goods, especially if a rise in the latter is accompanied by a similar decline in prices of other goods. However, an additional hypothesis made by structuralists, which turns relative prices increases into overall inflationary pressure, is that prices in nonfood and nontraded goods are inflexible downward. Wachter(1976) argues, generally, that downward inflexibility of prices is due to oligopolistic market power in manufacturing and services sectors. However, the existence of downward price inflexibility is considered, by structuralists, as an institutional constraint. Wachter also has criticized this assumption as being theoretically unjustifiable, and she refers to a modified hypothesis where prices do not have to be completely downward inflexible.

Wachter's arguments imply that prices in various sectors may change asymmetrically, with different speeds. It is assumed that prices in nonfood sectors are to react more slowly than that in food sectors. This implies that even if excess demand for food is equivalent to excess supply of other product, the general price level rises as the result of the rise in the food prices will be quicker than the fall in the price of nonfood product, and vice versa if the excess supply exists in agriculture.

7.3.3 Propagation mechanisms

If the general price level is to keep rising there must be a propagation element or transmission mechanism. It is argued that there are three main propagation mechanisms.[12] Firstly, there is the budget deficit (the third bottleneck discussed above), which is financed by expansions in the money supply. Secondly, there is the wage price spiral, as, e.g., the relative prices of food rise, the cost of living of the wage-earning will rise, and wages will rise, which will spillover the cost of production. The latter will result in a rise in the relative

[12] For more details see,e.g. Sunkel (1960), Argy (1970), and Kirkpatrick and Nixson (1976).

prices via, as pointed out by Baer (1967), passing on increased cost to consumers by producers. Thirdly, there is the instability of export earnings, which tends to create upward pressure on the general price level. This takes place when a reduction in export earnings leads to a decline in government revenues. The government then resorts to deficit financing to maintain relatively constant level of expenditure.

In addition to these three propagation mechanisms, there is another one referred to by Sunkel (1960). This is the import subsidy system, where the government may subsidise imported foodstuffs, fuel, and capital goods in order to alleviate inflation. Such government subsidies have been a key issue in the Fund adjustment programmes to Egypt. However, this may lead to further inflation if there is any decline in export receipts relative to import payments, as the government tries to devalue to increase exports, but devaluation will increase, as mentioned above, the domestic price of imported goods. Furthermore, exports may not increase as a result of devaluation because of inelastic demand for LDCs's exports, but this pessimistic view of devaluation in Egypt was not supported, as the price elasticity of demand for exports is found to be almost a unity, see chapter 4. Thus, it can be noted that to the structuralist an increase in the money supply, mainly originated from structural constraints, is seen as a necessary condition for the rise in the general price level, but it is not a sufficient condition.

The question arises as to the empirical support for the above structuralist hypothesis to inflation in LDCs? There have been a number of attempts to test empirically the above relationship between inflation and the structural variables.[13] In the light of the empirical evidence from several studies, it is difficult to conclude that inflation in LDCs is only a structural phenomenon. But it could be argued that a broad model of inflation like that developed by Wachter (1976) can explain inflation better than either the monetarist model or the structuralist model. Nonetheless, the way the structural factors are measured is subject to criticism, since there is no unique indicator for each structural bottleneck, especially as proxies have to be used to measure several of the effects set out above.

7.4 INFLATION IN EGYPT

In this section three aspects of the inflation in Egypt are to be examined, firstly, trends of inflation over the study period, secondly, a brief review of the previous studies of Egypt's inflation, and finally, empirical results of the present study

[13] These studies are for example, Mueller (1965) for Mexico, Edel (1969) for eight Latin American countries, Argy (1970) for 22 developing countries, Wachter (1976) for Argentina, Brazil, Chile, and Mexico, and Bhalla (1981) for 30 developing countries.

for monetary and structural models of inflation.

7.4.1 Trends of Inflation In Egypt

During the first ten years of the study period (1952-61), Egypt had experienced a very low annual average rate of inflation, based on CPI (0.7 percentage per annum over this period). Furthermore, there was deflation in some years.[14] In the next decade (1962-71), which coincided with the implementation of ambitious development plans, the inflation rate rose to an annual average of 4.05 percent. There was a sudden upsurge in the inflation rate in 1965 and 1966. This could be attributed to three causes; i) an increase in the aggregate demand as a result of the implementation of the first five-year development plan (1960-65); ii) the devaluation of the pound by 25 percent in 1962; and iii) the termination of the U.S.A. assistance of food grain in 1964/65, so the rate of inflation rose as Egypt had to pay for imports of food grain with a devalued pound.

Since the early 1970s, there has been,in Egypt as in most countries, an acceleration in the rate of inflation. This rate increased, for Egypt, from an annual average 7.4 percent during the 1972-76 period to 16.7 percent over the 1982-86 period. It

[14] There was a deflation of -4.01, -4.18, -4.55, and -2.76 percents in years 1953, 1954, 1956, and 1962, respectively.

has been argued by Bhalla (1981) that the rise in oil prices and the price of food were amongst the popular causes of inflation in the 1970s. In the case of Egypt, however, the former was not a substantial cause of inflation as Egypt became a net oil exporter in the mid-1970s, and the domestic price of oil was kept below the world price level by government subsidies. However, the domestic price of energy has been raised recently as required by the Fund adjustment programme. In the meantime, it could be argued that the price of imported food commodities contributed more to the inflation spiral. The impact of import prices on inflation will be tested below. The question is what are the origins of inflation in Egypt? This question will be considered in the next two sub-sections.

7.4.2 Previous Empirical Evidence

It seems that the first comprehensive study on Egypt's inflation is Zaki's study of "inflation in Egypt".[15] In his analysis of inflation in Egypt, Zaki adopts three approaches. The first is a monetarist one via the conventional quantity theory of Fisher (1911). According to the quantity money equation (identity), the volume of transactions must be equal to the quantity of money times the velocity of circulation. The quantity theory states that changes in the money supply cause changes in the

[15] All the arguments from Zaki's study are taken from Teleb (1985).

price level,with stable velocity and full employment.

Zaki has attempted to study changes in money supply, velocity and income and their impacts on the price level. His findings are that money supply increases at a much higher rate than real income, and velocity of circulation does not significantly fall. This, as he points out, brought about rises in the price level. In fact, Zaki's findings about the rates of growth in the money supply, real income and the velocity of circulation can be confirmed.[16] However, his conclusion is ambiguous. On the one hand, the quantity theory is an identity consistent with the hypothesis that causation runs from money to the price level, as well as from prices to money. On the other hand, Zaki's findings about changes in real income and velocity of circulation violate the basic assumptions of this theory. Furthermore, it has been argued above that the supply of money is endogenous and the money stock is demand determined, see chapters 5 and 6.

In his study about inflation in Egypt, Zaki (1980) also points out a number of cost-push factors, which are: a) Rising import prices; b) rising wages in some sectors of the economy; c) a decline in productivity growth for the whole economy; d) underutilization of capacity in both public and private sectors;

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[16] Analyzing the statistics of these three variables over the present study period supports Zaki' arguments.

e) continuous rises in land prices; and h) rising interest rates. Some of these factors may be causes of inflation, especially import prices, but Zaki's cost-push analysis of inflation in Egypt is descriptive, and if there is an influence on inflation by any of these factors, it should be examined through a testable model.

Zaki continues his arguments about inflation in Egypt identifying six main structural bottlenecks, which may lead to inflation in the economy: firstly, the gap between the actual investment and domestic saving; secondly, the slowdown of the growth in agricultural production comparing to the "dramatic" increase in the demand for agricultural products; thirdly, the higher rate of growth in services sector relative to that of the commodity sector; fourthly, the high growth rate of population accompanied by inflexibility in aggregate supply; fifthly, the alleged deficiency in the taxation system; and finally, the expansion in the size of the major cities.[17]

Apart from how these structural bottlenecks affect inflation in Egypt, as described by Zaki, these bottlenecks were modelled and their impacts on inflation have been tested in the 1960s in most Latin American countries, individually. But Zaki does not provide a testable model to estimate the relation between these

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[17] For a detailed explanation of these structural constraints and how they influence the inflation, see Zaki (1980), and Teleb (1985).

structural bottlenecks and inflation in Egypt. Thus, Zaki's study offers incomplete evidence for the determinants of inflation.

On the other hand, a monetary model of inflation has been estimated for Egypt amongst other developing countries, Bhalla (1981) using annual data for the period 1961-75, obtained the following estimates for Egypt: (t-values are in parentheses),

$$\dot{p}_t = \underset{(2.16)}{2.39} - \underset{(3.28)}{0.57}\,\dot{y}_t + \underset{(1.06)}{0.18}\,\dot{A} + \underset{(1.15)}{0.15}\,\dot{M}_t + \underset{(1.66)}{0.22}\,\dot{M}_{t-1}$$

$$\bar{R}^2 = 0.698 \qquad\qquad D.W. = 1.80$$

It is quite obvious that all the coefficients have the expected signs. However, the only significant variable is the rate of change in income. It is also to be noted that the sum of coefficients on M and lagged M is not significantly different from plus one, neither the coefficient of Y from minus one. Also the D.W. statistic is not reliable as the lagged dependent variable is included as a proxy for the cost of holding money, A.

In an attempt to test for the influence of structural variables on inflation, Bhalla augments the above monetarist equation with two structural factors: the percentage change in the relative price of food, P_r, and the percentage change in import prices, P_m. His regression results for Egypt are: (t-values are in parentheses),

$$\dot{P}_t = \underset{(1.96)}{2.65} - \underset{(3.27)}{0.55}\ \dot{y}_t + \underset{(0.24)}{0.04}\ A + \underset{(1.16)}{0.15}\ \dot{M}_t + \underset{(1.16)}{0.16}\ \dot{M}_{t-1}$$

$$+ \underset{(1.62)}{0.28}\ \dot{P}_r - \underset{(0.71)}{0.05}\ \dot{P}_m$$

$$\bar{R}^2 = 0.719 \qquad D.W. = 1.86$$

It is apparent that the inclusion of structural variables does not substantially improve the performance of the equation. furthermore, the two structural variables are not significantly different from zero, and the coefficient of import prices appears with a wrong sign. Accordingly, it can be pointed out that food and import prices did not affect inflation in Egypt during the period 1961-75 in this particular study.

In an attempt to determine the influence of the structuralist constraints on inflation, Gemmell (1982) has examined the role of the non-market sector in Egypt's inflation. Gemmell argues that the excessive relative growth of the non-market sector, which is identified with all services provided free by government, e.g. education and defence, puts upward pressure on prices. This argument is based on the assumption that an increase in the relative size of the non-market sector is to be caused by a transfer of workers from the market to non-market sector. This will result in greater demands for market sector goods and services by those not directly involved in its current supply.

Using annual data for the period 1961-76, Gemmell has then estimated an inflation equation, in which the inflation rate, measured by the rate of change of the wholesale price index,is a function of excess demand for marketed output.[18] Excess demand has been measured by two indicators: The first is the ratio of market sector consumption to aggregate consumption, C_m, and the second is the deviation of the annual growth rates in marketed output from a constant trend rate of growth,lagged one period, $(y_m)_{t-1}$. Thus, his regression results are: (t-values are in parentheses),

$$\dot{p}_t = \underset{(3.69)}{15.11} - \underset{(3.09)}{0.26}\,(C_m)_t + \underset{(5.42)}{0.49}\,(y^{\cdot}_m)_{t-1} + \underset{(4.00)}{9.05}\,D$$

$$\bar{R}^2 = 0.81 \qquad \text{D.W.} = 1.20$$

The variable D is a dummy variable for the 1973 war, which was assumed to create a large exogenous effect on prices.[19] Both indicators of excess demand have the expected coefficient and also significant. However, Gemmell's approach can be criticized

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[18] Gemmell (1982) argues that there are many exogenous factors that influence inflation,e.g. rises in import prices,but he does not include any other variable in his equation,except the excess demand for marketed output.

[19] It is not understandable why Gemmell has chosen to include a war dummy variable for only the 1973 war, despite his period of study includes other war years, e.g. the 1967 war.

for the assumption of constant aggregate demand. Also, the effect of the growth of non-market sector on inflation should be examined through its impact on aggregate demand, not through its effect on the demand of the market sector. It could also be argued that the growth in the market sector may slowdown in the short-run, but in the long-run, growth of the non-market sector can improve productivity throughout the economy.

The most comprehensive quantitative study of the causes of inflation in Egypt is Teleb's study (1985). Unlike the previous studies Teleb has relaxed the assumption of the exogeneity of the money supply and considered the fact that Egypt is an open economy.[20] After his thorough examination of the behaviour of the demand and supply of money in Egypt, Teleb suggests a more general model of inflation, which relates the rate of inflation to a monetary factor, measured by the excess supply of money, and cost-push variables (foreign inflation and the rate of change in indirect taxation). Two structural variables are included, which are the excess demand in the agricultural sector and the excess demand for imports.[21]

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[20] However he does not sopport that openness in his model of inflation in open economies.

[21] The excess demand for imports was dropped because it is found not significant and has a wrong negative sign. The excess demand for agricultural sector is measured as the deviation of the actual agricultural output from trend. The excess demand for imports also measured as the excess demand for agricultural output.

Using quarterly data for the period 1970.i-1982.iv, with interpolated data for income, Teleb estimated his general equation for inflation in Egypt. The results are: (t-values are in parentheses),

$$
\begin{aligned}
d\ \ln p_t = & \underset{(1.03)}{-0.0318} + \underset{(1.79)}{0.303}\ EXCESS_{t-1} + \underset{(1.99)}{0.413}\ d\ \ln USPI_t\ e_t + \\
& \underset{(2.03)}{0.106}\ d\ \ln ind_{t-2} + \underset{(1.85)}{0.032}\ DAGR_{t-1} + \underset{(0.47)}{0.00329}\ D1 \\
& + \underset{(1.41)}{0.00992}\ D2 - \underset{(0.84)}{0.0059}\ D3
\end{aligned}
$$

$R^{-2} = 0.40$ $\qquad$ D.W. = 1.73

Where EXCESS is excess money supply, USPI e is the foreign inflation in domestic currency terms (measured by USA CPI), ind is the rate of change of indirect taxation, DAGR is the excess demand for agricultural production, and D1, D2, and D3 are three seasonal dummy variables. It is apparent that all coefficients display the correct signs, and are significant at various levels. However, the explanatory power of the above equation is relatively low, as $R^{-2} = 0.4$, i.e. all the explanatory variables in this equation explain only 40 percent of the variance in inflation in Egypt over the 1970-1982 period.

In addition, despite his separate study of the demand for and supply of money functions, Teleb has not used them in his equation of inflation to measure the excess supply of money, but has followed the traditional method of measuring it as the deviation of the actual money supply from the trend.[22] In fact, Teleb's equation of inflation is similar to those equations which determine inflation by the Phillips-type relationship.[23] Thus, Teleb has not even considered any role for expectations. Also, in this kind of model imported inflation is best measured by the rate of change of the import prices.[24] However, Teleb's study successfully determines the impact of structural factors on inflation, such as agricultural bottlenecks and limitation of taxation system, which Zaki (1980) and Gemmell (1982) failed to do so.

Tegene (1989 b) estimated a monetary model of the Harberger-type for Egypt among other African countries, using quarterly data for the period 1960-1983. However, unlike the traditional Harberger model, he employs an unconstrained Almon polynomial lag structure on each explanatory variable. His regression estimates for Egypt are: (standard errors are in parentheses),

$$\dot{p}_t = \underset{(0.0014)}{0.002} + \underset{(0.025)}{0.177}\ \dot{M}_{t-i} - \underset{(0.044)}{0.111}\ \dot{y}_{t-i} + \underset{(0.059)}{0.828}\ \dot{p}_{t-i}$$

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[22] in our examination of inflation in open economy we use the estimated demand for money to derive the excess supply of money.

[23] The augmented Phillips-type relationship of inflation equation with cost-push and structural factors has been employed in several studies, with the excess demand measured as the deviation of actual real income from trend, see e.g. Bhalla (1981), Laidler (1977), and Otani (1975)

[24] Ibid.

$$+ \underset{(0.022)}{0.107}\ \dot{w}_{t-i}$$

$\bar{R}^2 = 0.95$ Dh= 0.79

Where $\dot{p}$ is the rate of change in prices,measured by CPI, $\dot{w}$ is the world inflation rate, and the other variables are as defined previously. It is apparent that the results together support the monetary explanation of inflation in Egypt, as all coefficients show the expected signs and significant. Furthermore, $\bar{R}^2$ is very high, and the Dh statistic indicates the absence of autocorrelation. In addition, his causality test between prices and money confirms the monetary view of inflation, where the direction of causation runs from money to prices.

7.4.3 SOME NEW EVIDENCE FOR EGYPT

Monetary and structural models of inflation similar to those estimated for developing countries, as shown above, are estimated for Egypt using annual data for the period, 1952-86. As mentioned above in the monetary models of the Harberger type the method of generating structural lags for the money supply as well as the expected rate of inflation are ad hoc. Therefore, either of these models may not fit the data. Results of estimation of these models for Egypt are presented in table 7.1.

Table 7.1: **Estimates of Monetary and Structural Models of Inflation for Egypt (annual data, 1952-86)**

Dependent variable is $P^{\cdot}_t$

Independent Variables	Equations			
	(1)	(2)	(3)	(4)
Constant	0.016 (0.903)	-0.123 (4.976)	-0.091 (2.580)	-0.120 (4.120)
$d\ lnY_t$	-0.225 (1.627)		-0.144 (1.213)	-0.052 (0.530)
$d\ lnM_t$	0.221 (1.348)		0.168 (1.199)	-0.084 (0.626)
$d\ lnM_{t-1}$	0.242 (1.482)		0.051 (0.342)	0.026 (0.208)
A_t	-0.127 (0.725)			
$\dot{p}^e$		0.722 (5.917)	0.648 (3.349)	0.745 (4.646)
$d\ lnAGR_t$		0.340 (3.639)		0.374 (3.486)
$d\ lnSub_t$		-0.009 (0.917)		
$d\ lnpm_t$		0.105 (1.613)		0.113 (1.556)
D_t	0.022 (0.010)	-0.328 (2.595)	-0.031 (1.674)	-0.035 (2.035)
$\bar{R}^2$	0.524	0.795	0.657	0.786

A_t = $p^{\cdot}(-1) - p^{\cdot}(-2)$, as estimated in the traditional Harberger model.
p^e is obtained by regressing $p^{\cdot}_t$ on its value lagged for one and two periods.

Equation (1) in table 7.1 above gives estimates of a typical Harberger model, in which none of the coefficients on the explanatory variables is significantly different from zero. However, they have the expected signs, except that for the expected rate of inflation which is used as a proxy for the cost of holding cash balances. An alternative term for expected rate of inflation, p^e, is included in equation (3). Despite the significance of that expected rate of inflation term, all the other variables remain insignificant. This may indicate a correlation between the expected rate of inflation and the current rate of inflation.

In order to examine the effect of the above structural constraints on inflation in Egypt, equation (2) estimates inflation as a function of two main bottlenecks, a propagation factor and the expected rate of inflation. The first is in agriculture bottleneck which measured by the proportionate change in agricultural production, d lnAGR. According to the structuralist approach, a low growth rate in the agricultural production would lead to higher rate of inflation, and hence the coefficient on this variable, d lnAGR, is expected to be positive.[25] The second bottleneck is in foreign trade sectors, proxied by the rate of change in import prices. The propagation factor is the level of government subsidy, Sub.

It is apparent from the results that all the coefficients show

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[25] However, systematically, if a reduction in agricultural production increases the price level, the sign on AGR variable should be negative.

the correct signs. However, only the expected rate of inflation has a coefficient is significantly different from zero at the 1 percent level. Equation (4) is a broad model of inflation, which includes both monetary and structural variables. In fact, the results remain unchanged, as none of the monetary variables is significant, and the current money supply has a wrong sign, while the variables of expected rate of inflation and agricultural bottleneck do have significant coefficients.

It can be argued that the poor performance of the above equations is due, as mentioned above, to the ad hoc methods of generating both the lag structure of both the money supply and the expected rate of inflation. Also, measuring the proxy for the effect of agriculture bottleneck by the rate of growth of agricultural production is misleading, as it is not obvious whether this sector is in a state of excess demand or excess supply. Therefore, a broad model of inflation is developed and estimated in the next section.

7.5 THE BROAD MODEL OF INFLATION: EMPIRICAL RESULTS

The inflation model, in this section is based on the demand for money model that was developed and tested in chapter 6. Despite the stability of the demand for money equations in the error correction model, Hendry (1985) has warned against inverting such equations to determine the price level, pointing out that if this process has carried out it should produce "predictive" failure.[26] To consider this problem, the models that employ stock adjustment and adaptive expectation mechanisms have been used in determining the price level. Thus, solving model III for the rate of inflation, and using the rate of change, we obtain:

$$\begin{aligned} d\ lnp_t = a_o + a_1\ d\ lny_t + a_2\ d\ lny_{t-1} + a_3\ dlny_{t-2} + \\ a_4\ d\ lnM_t + a_5\ d\ lnM_{t-1} + a_6\ d\ lnM_{t-2} + \\ a_7\ d\ lnM_{t-3} + a_8\ d\ lnp_{t-1} + a_9\ D_t + u_t \end{aligned} \quad (7.4)$$

Equation (7.4) is a monetary model for inflation. All the variables are defined earlier, and all are expressed in differences in logs rates of growth. In order to capture the effect of structural bottlenecks on inflation, equation (7.4) is augmented with two main bottlenecks. The first is the agriculture sector bottleneck (measured by the excess demand for argricultural production, $EXAGR_t$, which is proxied by the difference between the actual and the trend of agricultural production). the second is the foreign trade bottleneck

[26] In addition to Hendry's empirical evidence, Arestis (1988) has obtained results for three developing countries (Mauritius, Malta, and Cyprus) that support Hendry's warning. Also, the results of the inverted equation of the error correction model of demand for money in Egypt over the present study period has produced a predictive failure.

(measured by the rate of change of import prices, pm_t).[27] Thus, equation (7.4) can be rewritten as:

$$
\begin{aligned}
d\ \ln p_t = {} & b_0 + b_1\ d\ \ln y_t + b_2\ d\ \ln y_{t-1} + b_3\ d\ \ln y_{t-2} + \\
& b_4\ d\ \ln M_t + b_5\ d\ \ln M_{t-1} + b_6\ d\ \ln M_{t-2} + \\
& b_7\ d\ \ln M_{t-3} + b_8\ d\ \ln p_{t-1} + b_9\ \ln EXAGR_t + \\
& b_{10}\ d\ \ln pm_t + b_{11}\ D_t + V_t \qquad (7.5)
\end{aligned}
$$

Results of estimation of equations (7.4) and (7.5) are presented in table 7.2, with t-values are in parentheses.

[27] The government subsidies and the relative price of food were included in the estimation process, but they are found to be insignificant. Therefore, they have been excluded from the estimated equations in table (2).

Table 7.2: OLS Estimates of Inflation Models for Egypt (versions of eq.(7.5),annual data, 1952-86)

Dependent Variable: d $\ln p_t$

Explanatory variables	Unrestricted Equations (1)	Unrestricted Equations (2)	Restricted Equation (1)	Restricted Equation (2)
Constant	0.020 (1.153)	0.008 (0.511)	0.028 (1.976)	0.019 (1.488)
d $\ln y_t$	-0.241 (1.881)	-0.088 (0.727)	-0.194 (1.796)	-0.186 (1.956)
d $\ln y_{t-1}$	0.055 (0.431)	0.150 (1.349)		
d $\ln y_{t-2}$	-0.255 (2.042)	-0.183 (1.688)	-0.275 (2.610)	-0.249 (2.696)
d $\ln M_t$	0.180 (1.297)	-0.143 (0.931)		
d $\ln M_{t-1}$	-0.044 (0.247)	0.030 (0.191)		
d $\ln M_{t-2}$	0.287 (1.505)	0.336 (2.068)	0.395 (3.125)	0.376 (3.427)
d $\ln M_{t-3}$	0.055 0.352	0.141 (1.014)		
d $\ln p_{t-1}$	0.131 (0.572)	0.114 (0.588)	0.215 (1.096)	0.204 (1.191)
$\ln EXAGR_t$		0.060 (1.709)		0.037 (1.173)
d $\ln pm_t$		0.276 (3.192)		0.204 (3.291)
D_t	-0.018 (0.922)	0.002 (0.118)	-0.020 (1.018)	-0.008 (0.430)
$\bar{R}^2$	0.652	0.751	0.674	0.755
LM(2)	1.619	1.898	0.861	0.881
F			1.037	1.486

LM is the Lagrane-Multiplier test for serial correlation.
F is F-test for linear restrictions.

It can be seen, from table 7.2 above, that the behaviour of the monetary model of inflation, equation (1), and the broad model, equation (2), is better than that of the Harberger model type presented in table 7.1. The coefficients of equation (1) have the expected signs, but only those of the real income lagged for two periods is significant at 5 percent level, and real income and the money supply lagged for two periods are significantly different from zero at 10 percent level. Also, LM test indicates the absence of serial correlation up to second-order at the 5 percent level. Results of equation (2) show that the inclusion of the two main bottlenecks reduce the sizes of coefficients on real income. However, the coefficients of $EXAGR_t$ and pm_t still show the expected sign, and only pm is significantly different from zero at 5 percent level. The expected inflation rate, p_{t-1}, is not significant, where the coefficient of the lagged money supply for two periods has become significant at 5 percent level.

Estimates of the restricted equations (1) and (2) are shown in table 7.2, above. F-statistics indicate that the null hypothesis does not reject restrictions on the two equations, and there is no autocorrelation problem, as shown by second-order LM(2). In the restricted monetary model, eq. (1), all the coefficients have the expected signs, but only the coefficients of Y_{t-2}, and M_{t-2} are significant at 5 percent level. On the other hand, in the restricted broad model, eq.(2), all coefficients show the correct signs and are significant at various degrees of significant levels, except the coefficients of $EXAGR_t$ and P_{t-1}. Thus, equation (2) of the restricted model is superior to (1). However, the coefficient on lagged money supply is small and influences rate of inflation through a long lag structure. This implies that monetary expansion in Egypt may lead to a less proportionate rise in prices than that in the money supply, as mentioned in chapter 6. The effect of wars on inflation in Egypt was negative, but not significant, as shown by the coefficient on the war dummy, D_t.

From the results of the two models above, it can be seen that changes in the real GNP and the money supply affect the rate of inflation through lags. However, the broad model is more appropriate in explaining the inflation in Egypt over the study period. The conclusion which can be drawn is that monetary effects, structural bottlenecks in the foreign trade sector and less significant in agricultural sector, and real effects have all significantly contributed to generating inflation in Egypt.

The above models, however, specify inflation in a closed economy, ignoring the proposition that the prices of traded goods of most developing countries are determined in the world market, as shown for Egypt's prices of exports and imports in chapter 4. This implies that the domestic rate of inflation can be determined, to a large extent by world inflation. Since it has been found that prices of Egypt's traded goods (exports and imports) are determined in the world market, the model of inflation in open economies can be used as an extension to that in closed economies.

7.6 INFLATION IN AN OPEN ECONOMY

The analysis of inflation in an open economy has been undertaken in two major theoretical frameworks. The first is the Scandinavian model.[28] The second is the monetary approach to the balance of payments and world inflation.[29] Both models define the domestic price level as a weighted average of the prices of traded and non-traded goods. It is assumed in both models also that the prices of traded goods are determined in world markets, as the individual country is postulated to act as a price taker. This follows from the assumption, in a small open economy, that goods are perfectly arbitraged, and therefore the "law of one price" prevails.

The two models, however, differ over the determination of the

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[28] For studies that adopt the scandinavian model see e.g. Aukrust (1970, 1977), Calmfors and Herin(1979), Edgren, et al (1973), and lindbeck (1979). These studies analyse inflation in open economies with fixed exchange rate. For the same approach with floating exchange rate, see studies in Lindbeck (1979).

[29] For studies employing the monetary model, see e.g. Dornbusch (1973), Johnson (1972), Cross and laidler (1976), Laidler (1975), Swoboda (1977), for developed countries. For LDCs see Blejer (1977, 1979), Otani (1975), and Sarantis (1984).

prices of non-traded goods. The Scandinavian model assumes that the prices of non-traded goods are determined by the rate of change of unit labour costs. The monetary model postulates that the rate of change of the price of non-traded goods depends on excess demand and inflation expectations, where the former is measured by the rate of change of domestic credit. In the present study, however, only the monetary model is followed with some amendments.[30]

Following the monetary approach to inflation in open economies, the equilibrium condition in the monetary sector can be expressed as follows:

$$d\ \ln m^d = f(\ y^e,\ r,\ p^e\ ) \tag{7.6}$$

$$d\ \ln M^d = d\ \ln p + d\ \ln m^d \tag{7.7}$$

$$d\ \ln M^s = d\ \ln K + a\ d\ \ln DC + (1-a)\ d\ \ln R \tag{7.8}$$

$$M^s = M^d \tag{7.9}$$

Where;

m^d = the demand for real money balances.

y^e = the expected (permanent) real income.

r = the interest rates.

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[30] This focus on the monetary model is due to the fact that the available data on the unit labour cost for Egypt are inadequate, and in regression results of inflation equations, which are not reported here, the wage rate appears with a wrong negative sign.

p^e = the expected rate of inflation.

M^d = the demand for nominal money balances.

p = the domestic price level (CPI).

M^s = the supply of money.

R = Foreign assets (foreign component of the monetary base).

K = the money multiplier.

DC = domestic credit.

Equation (7.6) specifies the demand for real money balances as a function of the expected real income,the interest rate, and the expected rate of inflation. Equation (7.7) is the demand for nominal money balances. In equation (7.8) the supply of money in an open economy depends on the money multiplier, K, and the monetary base, H. Where H can be expressed as;

$$H = h(DC + R) \tag{7.10}$$

Thus, this model of domestic inflation has assumed that Egypt is a small open economy and the prices of traded goods are determined in the world market. The domestic price level is also assumed to be a geometrically weighted average of the rate of change in the prices of traded and non-traded goods, thus;

$$d\ lnp_t = b\ d\ lnp^T + (1-b)\ d\ lnp^{NT};\ 0 \leq b \leq 1 \tag{7.11}$$

Where p^T is the prices of traded goods, p^{NT} is the price of non-traded goods, and b is the share of traded goods in total expenditure.[31]

According to the monetary approach to the balance of payments, in an open economy with fixed exchange rate the supply of nominal money balances is assumed to be beyond the control of the monetary authority. However, following Blejer (1977, 1979) the monetary authority can only determine the ex ante supply of money by changing the domestic component of the monetary base or manipulate variables under its control so as to change the value of the money multiplier.[32] Thus, any change in the money supply by the monetary authority (the Central Bank) interacts with the flow demand for money, where the latter is generated by adjustment of the desired stock of real money balances as a result of changes in real variables and expectations.[33] The public responds to the excess supply of money through changing the foreign component of the monetary base (foreign assets of BOP), and the rate of inflation. Thus, the ex post nominal quantity of money is not exogenous.[34]

The gap between the ex ante change in the supply of money and

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[31] Scobie (1983) interprets b as a coefficient that measures the degree of openness of the economy.

[32] For details on the money multiplier see chapter (5).

[33] For the demand for money function see chapter (6).

[34] It is assumed that the monetary authority chooses not to sterilize changes in foreign assets.

changes in the demand for real money, g, can be written as:

$$g = d\ \ln K + d\ \ln DC - (d\ \ln p + d\ \ln m^{d}) \tag{7.12}$$

It is assumed that the change in the relative prices of traded and non-traded goods varies monotonically with the excess demand for goods or the excess supply of money. Thus the relative price movement of traded to non-traded goods in terms of ex ante disequilibrium in the money market is:

$$d\ \ln p^{NT} - d\ \ln p^{T} = a\ d\ (g) \tag{7.13}$$

Where a is the elasticity of relative prices with respect to the monetary disequilibrium. Equations (7.12) and (7.13) indicate that in a small open economy the rate of domestic inflation relative to the world inflation is determined by domestic excess supply of money in the short-run

Since the prices of traded goods are determined in the world market, the prices of non-traded goods can be obtained by solving equations (7.12) and (7.13) for p^{NT}, thus;

$$d\ \ln p^{NT} = d\ \ln p^{T} + a\ d(d\ \ln K + d\ \ln DC - d\ \ln p - d\ \ln m^{d}) \tag{7.14}$$

Substituting for the price of non-traded goods, eq. (7.14), into equation (7.11), and solving for the domestic rate of inflation, d lnp, we obtain:

$$d\ \ln P_t = b_1\ d\ \ln p^T + b_2\ d\ (d\ \ln K + d\ \ln DC - d\ \ln m^d) \qquad (7.15)$$

Where:

$$b_1 = \frac{1}{1 + a(1-b)}, \quad \text{and} \quad b_2 = \frac{a(1-b)}{1 + a(1-b)}$$

Equation (7.15) indicates that the rate of domestic inflation is a function of the world rate of inflation (measured as the rate of change of prices of tradeables) and the rate of change of ex ante excess supply of money. It can also assumed that domestic price level does not adjust instantaneously to the monetary disequilibrium. Thus, we assume here for simplicity that the prices adjust by a partial adjustment mechanism, hence a lagged dependent term is added to equation (7.15).

The above model of domestic inflation is based, as mentioned above, on the assumption of perfect commodity arbitrage which ensures common prices for each commodity throughout the world, or the "law of one price". The empirical evidence,however, does not support this assumption. For example, Isard (1977) has pointed out that the law of one price violated as exchange rate changes substantially alter the relative dollar-equivalent prices of most domestic and foreign manufactured goods. Calmfors and Herin (1979) also, found that the prices of domestically produced traded goods in Sweden are strongly affected by changes in domestic factors. Therefore, the exchange rate should be included in the domestic rate of inflation equation. Thus, equation (7.11) can be rewritten as follows:

$$d\ lnp_t = b\ (d\ lnp^T + d\ lner_t\ ) + (1-b)\ d\ lnp^{NT} \qquad (7.16)$$

Here er is the exchange rate measured in units of domestic currency per unit of foreign currency, i.e. U.S. dollar. Substituting for the price of non-traded goods, eq. (7.14) into eq. (7.16) produces an equation of the domestic rate of inflation. It is further assumed that the money multiplier is constant, and hence the change in the money supply is measured by changes in domestic credit only. Thus, the excess supply of money, EXCEM3, is measured as ($d\ lnDC - d\ lnm^d$), with $d\ lnm^d$ taken as estimated in chapter 6 for stock adjustment-adaptive expectations model II. Results of estimation of such an inflation equation are presented in table 7.3.[35]

[35] Results of estimating these equations with the exchange rate are not reported, as its coefficient was not significant.

Table 7.3: OLS Estimates of Inflation Model in An Open Economy: Egypt, annual data, 1952-1986)

Dependent Variable: $d\ lnP_t$

Explanatory Variables	Equations (1)	(2)
Constant	-.006	0.001
	(0.382)	(0.074)
$d\ lnwp_t$	1.049	0.629
	(6.103)	(2.623)
$d\ lnEXCEM3_t$	0.029	0.029
	(1.287)	(1.380)
$d\ lnp_{t-1}$		0.403
		(2.349)
D_t	-0.031	-0.029
	(1.689)	(1.706)
$\bar{R}^2$	0.579	0.634
DW	1.321	2.050

t-values are in parentheses.

It can be seen from the results of table 7.3 that the world inflation variable is significantly different from unity at the 1 percent level in eq. (1), but only significantly different from zero at the 5 percent level in eq. (2).[36] This implies that the domestic rate of inflation was significantly influenced by the world inflation. In contrast, the coefficient of the excess supply of money, EXCEM3, is not significant in all equations. This implies that there is no significant feedback from money to prices.

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[36] The estimated coefficient of the world inflation is similar to that estimated by Blejer (1977) for Mexico (0.639), using the expected rate of inflation in estimating the money demand (m3).

7.7 CONCLUSIONS

The main objective of this chapter has been to examine the IMF view that inflation is a monetary phenomenon. Theories of inflation that are most often applied in LDCs are studied. According to previous empirical evidence, it is difficult to conclude that inflation in LDCs is caused solely by either pure monetary or structural factors. This conclusion is supported by empirical results of estimating either monetary or structural model for Egypt over the period 1952-86.

In contrast a broad model contains monetary, expectations, and structural factors substantially explained inflation in Egypt over the sample period. However, monetary expansion as a cause of inflation in Egypt is less significant in both models of inflation estimated in this chapter.

The main conclusion which may be drawn is that inflation in Egypt is not only a monetary phenomenon or caused mainly by excess money supply as the IMF approach assumed. Therefore, there is a significant influence on inflation by real factors, imported inflation, but changes in money supply appear to affect inflation after long lags in Egypt.

CHAPTER 8

A GENERAL MACRO MODEL FOR THE EGYPTIAN ECONOMY

8.1 INTRODUCTION

It has been shown earlier, in chapter 3, that the Fund approach to BOP adjustment, as set out by its staff, lacks an equation for real output. There have, however, been a few attempts to fill this gap by introducing an output equation based mainly on the neo-classical/monetarist assumption of full employment. In other words, output is assumed to be predetermined by the supply-side. This makes the Fund adjustment package of austerity, devaluation, structural adjustment via elimination of price distortions, and other demand restraint policies, rather contractionary for the economy. In other words, as Finch (1983 p. 77) points out "**it almost seems paradoxical to suggest that an effort to reduce absorption can also be expected to lead to economic growth**".

This chapter aims at introducing the missing output equation, which depends on demand-side forces with a role for expectations. The major macroeconomic variables have been examined in the context of the economy of Egypt in the last four chapters, here an attempt is made to set out and simultaneously estimate a highly aggregated general dynamic macroeconomic model. This model can explain the movements in Egypt's prices, real output, and BOP. The rest of the chapter is organized as follows: Section 8.2 provides a specification of the model. Results of estimation are taken up in section 8.3. Section 8.4 considers simulation results to show the ability of the model to track the independent variables. Conclusions are presented in section 8.5.

8.2 SPECIFICATION OF THE MODEL

Due to the structure of Egypt's economy, the model considers only two markets: the market for goods and the money market. The market for bonds is ignored because of its underdeveloped condition. Generally, it is assumed that there are three goods: domestically produced goods, exports, and imports. Prices of exports and imports are taken to be exogenously determined, as shown in chapter 4. It is also assumed that the exchange rate is pegged, but it can be changed by the authorities for adjustment purposes. The money supply is also assumed to be endogenous.

The model contains 7 stochastic equations determining the following variables: real domestic expenditure, volume of exports, volume of imports, real output (GNP), demand for financial assets (money), inflation, and government revenues. There are three identities that define the change in domestic credit, the stock of money supply (high-powered money), and the change in international reserves. Each of these equation is discussed below.

8.2.1 <u>Real Domestic Expenditure</u>

Real government expenditure on goods and services is assumed to be exogenous.[1] The aggregate domestic commodity demand, then, includes the private consumption plus investment, both private and public, (C+I). The desired level (or long-run) of demand for real domestic expenditure, EXP^*, is taken to be a function of real income, y, and excess flow demand for real cash balances, measured by the difference between the real actual money balances, which is taken to be equal to that of the previous period, and the desired demand for real money balances, thus,

$$LnEXP^*_t = a_0 + a_1 \ln y_t + a_2 \left(\ln \frac{M}{p_{t-1}} - \ln \frac{M^*}{p_t}\right) \qquad (8.1)$$

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[1] In their synthesis of monetary and Keynesian approaches to BOP, Frenkel, Gylfason, and Helliwell (1980), and Gylfason and Helliwell (1983) assumed that government expenditure (real) is exogenous and policy variable. The same assumption has been used in empirical studies, e.g. on U.K. by Jonson (1976), and on U.S.A. by Laidler and Bentley (1983).

The excess flow demand for money term is included to provide a link between money balances and expenditure, on the one hand, and to represent the effects of hoarding and dishoarding of financial assets (money) on expenditure.[2]

It is assumed that actual real expenditure adjusts towards its desired level following a partial adjustment mechanism:

$$D\ \ln EXP_t = B_1\ (\ln EXP^*_t - \ln EXP_{t-1}) \tag{8.2}$$

D denotes the first difference, B_1 is the adjustment coefficient. The expected signs for the parameters are: $B_1 > 0$, $a_1 > 0$, $a_2 < 0$.

8.2.2 Exports

The long-run demand for exports (quantity) is taken to be a function of real world income, yw, and the relative prices, i.e. the export prices, px, relative to world prices, wp, both adjusted for exchange rate, e, measured by units of Egyptian pound per unit of U.S. dollar, thus,

$$Lnx^*_t = b_o + a_3\ \ln yw_t + a_4\ \ln\left(\frac{px}{wp}\right)_t \tag{8.3}$$

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[2] A similar equation to (8.1) is derived by Dornbusch (1973), but in nominal terms. The same equation, but in real terms is used by Dornbusch and Mussa (1975) in a model in which the money is the only asset.

Exports are assumed to change to remove the discrepancy between actual and desired level of exports, at a constant proportional rate, B_2. In addition, the speed of adjustment is influenced by a short-run supply constraint variable, defined as the ratio of actual domestic output, y, and its trend value, y^t. This provides a further test of the assumption that exports are reduced when the actual output is growing slower than its trend, and vice versa, thus,

$$D\ \ln x_t = B_2\ (\ln x^* - \ln x_{t-1}) + a_5\ \ln(y/y^t) \qquad (8.4)$$

The parameters are expected to have the following signs:
$B_2 > 0,\ a_3 > 0,\ a_4 < 0,\ a_5 <$ Or > 0.

8.2.3 Imports

The desired volume of imports is assumed to be a function of real domestic income, y, and the relative prices, i.e. the price of exports in domestic price terms, pm, relative to the domestic prices, pd. For estimation purposes the lagged real domestic income is used.[3] The supply of imports is, then, infinitely elastic, thus,

$$\mathrm{LnIm}^*_t = c_o + a_6\ \ln\left(\frac{pm.e}{pd}\right)_t + a_7\ \ln y_{t-1} \qquad (8.5)$$

[3] Parikh and Starmer (1988) have used a similar equation to (8.5).

Desired imports, Im^*, are assumed to adjust to the actual imports at a constant proportion, B_3, as follows:

$$D\ lnIm_t = B_3\ (lnIm^*_t - lnIm_{t-1}) \tag{8.6}$$

The signs of the parameters are expected to be: $B_3 > 0$, $a_6 < 0$, $a_7 > 0$.

8.2.4 Real Output

Unlike the recent attempts to modify or to complete the Fund approach, the present model permits output to alter under demand shocks.[4] This formulation is similar to that derived by Frenkel, Gylfason, and Helliwell (1980), Gylfason and Helliwell (1983), and also recommended by Taylor (1988) for improving IMF adjustment policies. Thus, real output is taken to be equal to aggregate expenditure, AEXP = (c+I+g+x), less imports, Im. In addition, this form of real income is modified to take into account the effects on output of expectations for aggregate expenditure and imports. The expectation of the former is assumed to equal that for domestic resources. Also expectations of imports affect output, as imports provide a substantial part of productive commodities, such as capital and investment goods. Thus, the

[4] see Khan and Montiel (1989), and Khan et al (1990).

desired level of real output can be written as:[5]

$$Lny^{*}_{t} = d_{o} + a_{8} \ln AEXP^{e}_{t} + a_{9} \ln IM^{e}_{t} \qquad (8.7)$$

The superscript e denotes an expected variable. Expected aggregate expenditure is generated using the adaptive expectation hypothesis, as follows:

$$LnAEXP^{e}_{t} = c_{1} \ln AEXP_{t} + (1-c_{1}) \ln AEXP^{e}_{t-1} \qquad (8.8)$$

Here c_1 is the elasticity of expectations, which should be less than unity. Similarly, expected imports, Im^e, are also generated by the adaptive expectations process.[6]

$$LnIm^{e} = c_{2} \ln Im_{t} + (1-c_{2}) \ln Im^{e}_{t-1} \qquad (8.9)$$

c_2 is the elasticity of expectations of imports, $0 < c_2 < 1$. Actual real output is assumed to adjust in response to the discrepancy between desired real output and actual output in the previous period,

$$D \ln y_{t} = B_{4} (\ln y^{*}_{t} - \ln y_{t-1}) \qquad (8.10)$$

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[5] A similar equation is used by Jonson (1976), but with the expected aggregate expenditure (or sales as defined by Jonson) are divided between domestic production and imports in proportion that depend on the relative prices of imports and domestic output.

[6] for details see chapter 6.

Signs of the parameters are expected to be: $B_4 > 0$, $a8 > 0$, $a_9 < 0$.

8.2.5 Demand For Financial Assets (Money)

As assumed above due to the underdeveloped financial market in Egypt, money is taken to be the main financial asset.[7] Thus, the desired demand for real money balances can be expressed as:

$$Lnm^*_t = e_o + a_{10}\ lny^e_t + a_{11}\ lnr_t + a_{12}\ p^{\cdot e}_t \tag{8.11}$$

The expected real income, y^e, and the expected rate of inflation, $p^{\cdot e}$, are generated by an adaptive expectations mechanism similar to that used for expected aggregate expenditure and imports.[8]

$$Lny^e_t = c_3\ lny_t + (1-c_3)\ lny^e_{t-1} \tag{8.12}$$

$$Lnp^{\cdot e}_t = c_4\ p^{\cdot}_t + (1-c_4)\ p^{\cdot e}_{t-1} \tag{8.13}$$

Actual real money balances are assumed to adjust to the difference between the desired money demand and the actual

[7] For other financial assets, which are mainly in form of time deposits, see chapter (5).

[8] The process of generating of both y^e and $p^{\cdot e}$ is explained in chapter 6 on the demand for money.

money balances in the previous period:

$$D\ lnm_t = B_5 \ (lnm^*_t - lnm_{t-1}) \qquad (8.14)$$

The expected signs of the parameters are: $c_3 > 0$, $c_4 > 0$, $B_5 > 0$, $a_{10} > 0$, $a_{11} < 0$, $a_{12} > 0$.

8.2.6 Inflation

It has been shown earlier that the domestic rate of inflation adjusts to changes in the world prices as well as to domestic supply bottlenecks. Thus, the rate of inflation is assumed to be influenced during the adjustment period by the deviation of domestic price level from the world prices adjusted for the exchange rate, e.pw.[9] The rate of inflation is assumed also to adjust to structural bottlenecks in the economy, measured particularly by the excess demand for agriculture production, and the expected rate of inflation. Thus, the inflation equation can be written as follows:

$$D\ lnp_t = f_o + a_{13}\ ln\left(\frac{e.pw}{p}\right)_t + a_{14}\ lnAGR_t + a_{15}\ D\ lnp_{t-1} \qquad (8.15)$$

[9] The proposition that domestic prices adjust towards purchasing-power parity is an essential part of the monetary approach. Also this assumption is one of the IMF policies in the case of Egypt, e.g. the domestic price of energy are to be raised to the world price level.

Here e is the exchange rate, measured by units of domestic currency per unit of U.S dollar, p is the domestic price level, AGR is the rate of change in agriculture production, and the expected rate of inflation is represented by the lagged rate of inflation. The three parameters are all predicted to have positive signs.

8.2.7 Government Revenue

The desired nominal government revenues are assumed to be a function of nominal income:[10]

$$LnT^{*} = g_{o} + a_{16} \quad (lny_{t} + lnp_{t}) \tag{8.16}$$

Nominal government revenues, T, adjust to the difference between desired revenues, T^{*}, and the actual revenues in the previous period;

$$D\ lnT_{t} = b_{6}\ (lnT^{*}_{t} - lnT_{t-1}) \tag{8.17}$$

The expected signs of the parameters are, $b_{6} > 0$, $a_{16} > 0$.

[10] This assumption in the case of Egypt is particularly true, as the income tax is the main source after the indirect taxes of the government revenues.

8.2.8 Money Supply, Domestic Credit, and BOP

The change in domestic credit, D DC, is equal to the change in credit to government, D GC, plus that to the private sector D CP, thus;

$$D\ DC_t = D\ GC_t + D\ CP_t \tag{8.18}$$

Since credit to government depends on the fiscal deficit, or budget deficit, (G - T), the change in domestic credit can be rewritten as:

$$D\ DC_t = D\ (G - T) + D\ CP_t \tag{8.19}$$

The specification of equation (8.19) allows for the effects of fiscal policy. The money supply in an open economy is equal to international reserves, R (in domestic currency terms), plus domestic credit,

$$M^s{}_t = R_t + DC_t \tag{8.20}$$

Monetary policy in Egypt has been mainly conducted by setting some changes in the money supply using domestic credit ceilings. Part of any consistent description of the workings of the Egyptian economy should include a policy reaction function to explain changes in the money supply, as the interest rate was constant over most of the study period. In addition, it was hardly ever used to control the money supply, as shown in chapter 5.[11] Credit ceilings have been imposed to reduce the expansion of money supply.

Domestic credit, as mentioned above, is equal to claims of the banking system on private sector and government or/and the public sector, where the latter is determined by the budget deficit. For estimation purposes, the supply of money equation is expressed in log-linear as follows:[12]

$$LnM_t = h_o + a_{17} \ln R_t + a_{18} (\ln G - \ln T)_t + a_{19} \ln CP_t \qquad (8.21)$$

The model is closed by an identity, which determines the change in reserves as the difference between the flow demand and supply of money, with the latter determined by the change in domestic credit. Thus;

$$D\ R_t = D\ M_t - D\ DC_t \qquad (8.22)$$

The model discussed above is different from that associated

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[11] Jonson (1975,1976) employed the change in the nominal bank rate (interest rate), as a policy reaction function for the money supply in the U.K.

[12] A very similar equation was used to estimate the supply of money in Indonesia, see Parikh (1989). Also Khan and Knight (1981) normalized both identities for domestic credit and money supply, in log- linear terms for estimation purpose.

with Fund financial-supported adjustment programmes in various respects. First, it is important to note that real output is determined by both demand and supply factors. The latter are represented by the assumptions that the elasticities of expectations of both expenditure and imports are equal to that of resources. Second, government expenditure on goods and services is exogenous. This implies that any increase in government spending will lead to an increase in income, through the multiplier process. The increase in government expenditures could lead to a rise in prices in the short-run. However, the long-run increases in income will offset the price rises. Furthermore, given that government revenues depend heavily on income tax, income increases are expected to result in a similar increase in the government revenues, thereby reducing the budget deficit and the growth of money supply. This then improves the balance of payments position.

On the other hand, a rise in the world prices, including import prices, provides two offsetting forces: exports and domestic output rise and imports decline, as the change in relative prices tend to shift domestic demand towards domestically produced goods. Meanwhile, it is assumed that Egypt will try to gain the benefit of the rise in the world prices, and hence its export prices, which are shown to be determined exogenously, by increasing the quantity of exportables or import substitutes.

Egypt's domestic prices, however, begin to rise through the expectations effect and also through the world price variable. There is a further effect through the pressure on domestic resources. Desired money demand starts to rise through upward revision of expectations and increased income in the demand for money equation. This tends to induce offsetting reductions in domestic expenditure, which are reinforced by a reduction in the real value of actual money balances induced by the rise in prices. Thus, the rise in nominal money balances associated with the increase in income and prices is expected to strengthen the balance of payments.

The model, therefore, is quite general and involves both monetary and real sides of the economy. It has also a dynamic structure based on partial adjustment and adaptive expectations, which is not considered by the few number of monetary models constructed within the Fund approach framework to balance of payments adjustment.[13] However, the role of the financial market is not present in this model, and hence the impact of interest rate on the demand for money may be very small or neglected. Here it is the expected rate of inflation which is the opportunity cost of holding money as alternative of real assets, such as land and houses, may affect the demand for money.

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[13] see the empirical studies in IMF (1977), and particularly Khan and Knight (1981,1982).

On the other hand, from the contemporary econometric point of view, the model has some inertia. This is related to the use of adaptive expectations rather than rational expectations, and the partial adjustment mechanism to generate a restricted lag structure. However, this formulation seems to be employed in the majority of LDCs. Further, and more importantly, the present study uses annual data for the period 1952-86, and more lags reduces the degrees of freedom. The technique used has resulted in three lags, which might be unlikely in the case of annual data. Nevertheless, the estimated parameters show the expected signs, as will be seen below.

8.3 ESTIMATION OF THE MODEL: STRUCTURAL PARAMETERS

The model described above is simultaneously estimated by an efficient full-information maximium likelihood method (FIML), using annual data for Egypt over the period 1952-86.[14] A war dummy variable was incorporated in each equation to capitare the war effects on various dependent variables.[15] The model was estimated with priori constraints imposed on the constant terms. The structural parameter estimates are as follows (t-values are in parentheses).

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[14] The model was also estimated by non-linear least squares method, but the convergence has not achieved.

[15] Jonson (1975,1976) used dummy variables for the first and second world wars in his estimation. Also Khan and Knight (1981) used country dummy variables,

$$LnEXP^*_t = a_o + \underset{(42.471)}{1.242} \ lny_t - \underset{(1.542)}{0.255} \ (\ln \frac{M}{p_{t-1}} - \ln \frac{M^*}{p_t}) \qquad (8.1)$$

$$D \ lnEXP_t = \underset{(11.246)}{0.821} \ (lnEXP^*_t - lnEXP_{t-1}) \qquad (8.2)$$

$$Lnx^*_t = b_o + \underset{(15.615)}{0.367} \ lnyw_t - \underset{(0.183)}{0.025} \ \ln(\frac{px.e}{wp.e})_t \qquad (8.3)$$

$$D \ lnx_t = \underset{(9.034)}{0.531} \ (lnx^* - lnx_{-1}) - \underset{(5.274)}{0.501} \ \ln(y/y^t) \qquad (8.4)$$

$$LnIm^*_t = c_o - \underset{(5.118)}{0.548} \ \ln (\frac{pm.e}{pd})_t + \underset{(17.499)}{0.365} \ lny_{t-1} \qquad (8.5)$$

$$D \ lnIm_t = \underset{(7.761)}{0.496} \ (lnIm^* - lnIm_{-1}) \qquad (8.6)$$

$$Lny^*_t = d_o + \underset{(12.146)}{0.371} \ \ln AEXP^e_t - \underset{(0.589)}{0.080} \ lnIM^e_t \qquad (8.7)$$

$$LnAEXP^e_t = \underset{(7.534)}{0.912} \ lnAEXP_t + (1-c_1) \ lnAEXP^e_{t-1} \qquad (8.8)$$

$$LnIm^e = \underset{(6.422)}{0.557} \ lnIm_t + (1-c_2) \ lnIm^e_{t-1} \qquad (8.9)$$

$$D \ lny_t = \underset{(8.069)}{1.116} \ (lny^*_t - lny_{t-1}) \qquad (8.10)$$

$$Lnm^*_t = e_o + \underset{(21.367)}{0.979} \ lny^e_t - \underset{(2.518)}{0.120} \ lnr_t - \underset{(2.994)}{0.161} \ p^{\cdot e}_t \qquad (8.11)$$

$$Lny^e_t = \underset{(7.413)}{0.516} \ lny_t + (1-c_3) \ lny^e_{t-1} \qquad (8.12)$$

$$Lnp^{\cdot e}_t = \underset{(4.634)}{0.287} \ p^{\cdot}_t + (1-c_4) \ p^{\cdot e}_{t-1} \qquad (8.13)$$

$$D\ \ln m_t = \underset{(12.722)}{1.464}\ (\ln m^*_t - \ln m_{t-1}) \qquad (8.14)$$

$$D\ \ln p_t = f_o + \underset{(2.965)}{0.049}\ \ln\left(\frac{wp.e}{p}\right) + \underset{(6.702)}{0.345}\ \ln AGR_t + \underset{(7.250)}{0.529}\ D\ \ln p_{t-1} \qquad (8.15)$$

$$LnT^* = g_o + \underset{(82.318)}{1.021}\ (\ln y_t + \ln p_t) \qquad (8.16)$$

$$D\ \ln T_t = \underset{(4.464)}{0.401}\ (\ln T^*_t - \ln T_{t-1}) \qquad (8.17)$$

$$LnM_t = h_o + \underset{(4.068)}{0.151}\ln R_t + \underset{(0.661)}{0.149}(\ln G - \ln T)_t + \underset{(32.642)}{0.989}\ln CP_t \qquad (8.21)$$

Generally, all the estimated parameters have the expected signs. Considering the adjustment speed measured by the elasticities of adjustment of the actual values of dependent variables to their desired values, i.e. B_1, B_2, B_3, B_4, B_5, and B_6, it is apparent that total domestic expenditure adjusts to changes in explanatory variables over a period slightly more than a year, as the elasticity of adjustment, B_1 is 0.821. On the other hand, while the demand for real cash balances adjusts over a period slightly higher than half a year, i.e. B_5 =1.464, real output adjusts to changes in explanatory variables over a period less than a year, as B_4 is 1.116. The other elasticities of adjustment for exports, imports and government revenues take longer periods to adjust to their desired levels, but imports adjust slightly more rapidly than exports. It also to be noted that all the adjustment elasticities are statistically significant at the 1 percent level.

There is also a lag structure created by expectations, especially for equations of real output and real demand for money balances. It is assumed that real output is influenced by expected changes in both total domestic expenditure, measured by private consumption plus total investment, (coefficient c_1), and imports (coefficient c_2). The demand for money is affected by expected change in real income (coefficient c_3), and expected rate of inflation (coefficient c_4). However, real output adjusts faster to expectations than does the demand for real money balances. All expectations elasticities are statistically significant at the 1 percent level. The general conclusion which may be drawn at this stage is that the economy adjusts rather more rapidly to desired value of dependent variables than the belief of a considerable rigidity might suggest.

Regarding the structural parameters, the income elasticity of domestic expenditure is relatively high, i.e. a_1 is higher than unity, and is statistically significant at the 1 percent level. On the other hand , the monetary disequilibrium term with coefficient a_2 tended to reduce domestic expenditure, but not significantly. In the export equation, coefficient of exogenous changes in world income and relative export prices, i.e. a_3 and a_4, have the expected signs, and the world income elasticity of demand for Egypt's exports is statistically significant at the 1 percent level, whereas the relative price elasticity is not significantly different from zero. The implication of this is that Egypt can increase her exports as long as world income rises, but Egypt, as mentioned in chapter 4, will capture a small percentage of world exports, as the world income elasticity is small, i.e. 0.376.

However, the supply constraint, which is measured by the ratio of actual capacity to its long-run level show that the slowdown in growth of output reduces exports. This is measured by a_5, which has a negative sign and is statistically significant at the 1 percent level. Therefore, increases in exports require a growth in output (capacity). This implies that the contractionary policies of the IMF adjustment programmes will lead to a slow growth in output and hence in exports, especially via devaluation which could be ineffective with the insignificant relative price elasticity. It is to be noted that including the supply constrain in the export equation above has resulted in a sharp decline in the relative price elasticity of demand for exports compared with that obtained for a single equation in chapter 4. This, on the other hand, might indicate that the problem low growth in exports is in the supply side.

The relative price elasticity of imports, a_6 has the expected sign and is statistically significant at the 1 percent level. The same is true for the income elasticity of demand for imports, a_7. Thus, the rise in import prices tends to reduce the demand for imports in favour of the domestically produced goods, and import substitutes. However, this requires increases in output capacity, and/or reallocation of domestic resources towards such import substitutes sectors. A study of these sectors and resource allocation is required at a disaggregated level and this is beyond the scope of this thesis.

The income elasticity of demand for imports, a_7, is less than unity, but it is highly significant. This may absorb a significant part of any growth in income, and hence cause the income to fall in next stage. However, this adverse effect is not significant, as shown by the coefficient of imports, a_9 in the income equation. In contrast, the increase in domestic expenditure significantly affects real income, as shown by a_8, as well as the expectations of domestic expenditure and imports. The former is assumed to measure the change in domestic resources, the latter measures the change in imports, of which a substantial part is productive commodities, i.e. investment and capital goods, and intermediate goods, as shown in chapter (2).

Unlike the earlier estimation of a single equation model of demand for money using stock adjustment and adaptive expectations, the demand for real money balances estimates here show that all coefficients have the expected signs. The elasticity of income, a_{10}, is significant different from unity at 1 percent level, whereas the coefficients of cost of holding money, both interest rate and expected rate of inflation, a_{11} and a_{12}, respectively, are significantly different from zero at 5 percent level. Also, the elasticities of expectations of income (c_3), and inflation (c_4), are statistically significant at the 1 percent level.

It is apparent that the domestic inflation rate is significantly influenced by the divergence of domestic prices from world prices, the slow growth in agriculture sector (measured by excess demand for agricultural products), and by price expectations. This is so because the three parameters, a_{13}, a_{14}, and a_{15}, show the expected signs, and are statistically significant at the 1 percent level. However, the coefficient a_{13} is very small indicating that the assumption for a small country of the law of one price may be applicable in the case of Egypt.

Considering fiscal policy, increases in income lead to an equiproportionate rise in government revenues. This tends to reduce the budget deficit, and hence domestic credit, and the growth of domestic component of money supply, which in turn improves the balance of payments, as the coefficient of foreign reserves, a_{16}, is significant. However, the coefficient on the budget deficit, a_{18}, in the money supply equation is not significant. This may due to the swung in domestic credit to the private sector since the inception of the open door economic policy in the early 1970s. Therefore, the coefficient of the domestic credit to the private sector, a_{19}, is very high and is highly significant.

8.4 SIMULATION RESULTS

In order to test the ability of the estimated model to track the behaviour of independent variables, the model was simulated dynamically over the sample period. A dynamic simulation of a macroeconometric model is itself a very stringent test of its goodness of fit. Actual and estimated values of selected dependent variables are plotted in Figures 8.1 - 8.4. These illustrate that the model broadly tracks the historical behaviour of some dependent variables rather well.

In addition other simulation diagnostics are presented in the table 8.1.

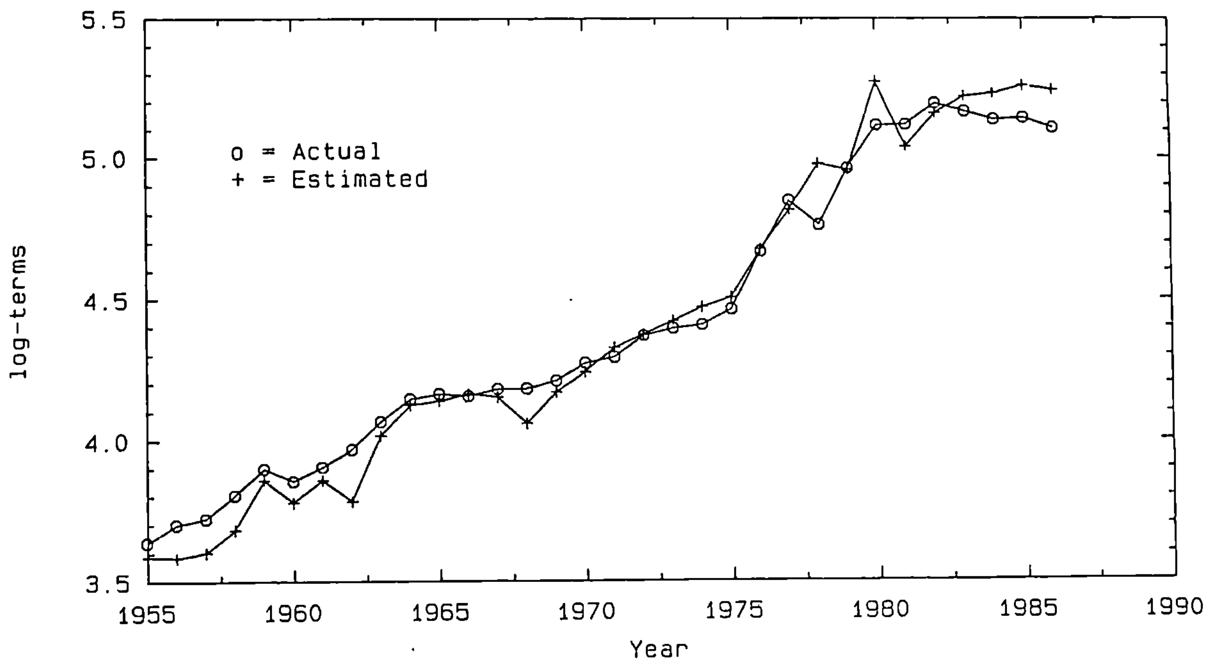

Figure 8.1: Actual and Estimated Real GNP.

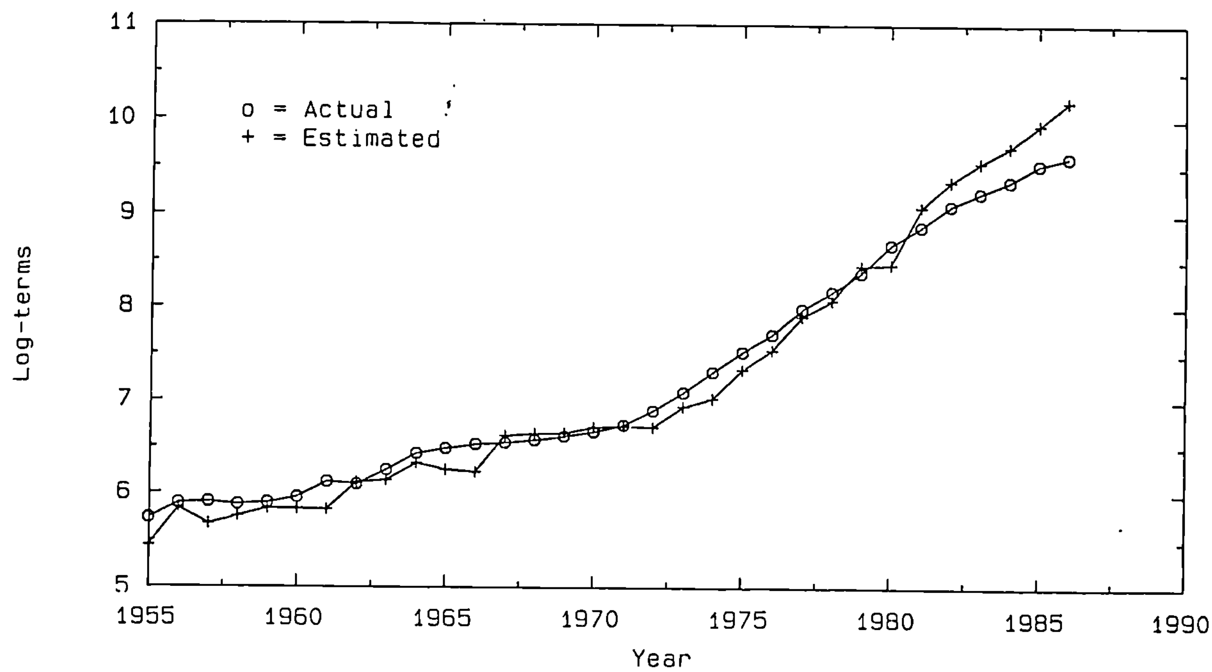

Figure 8.2: Actual and Estimated Nominal Money Supply.

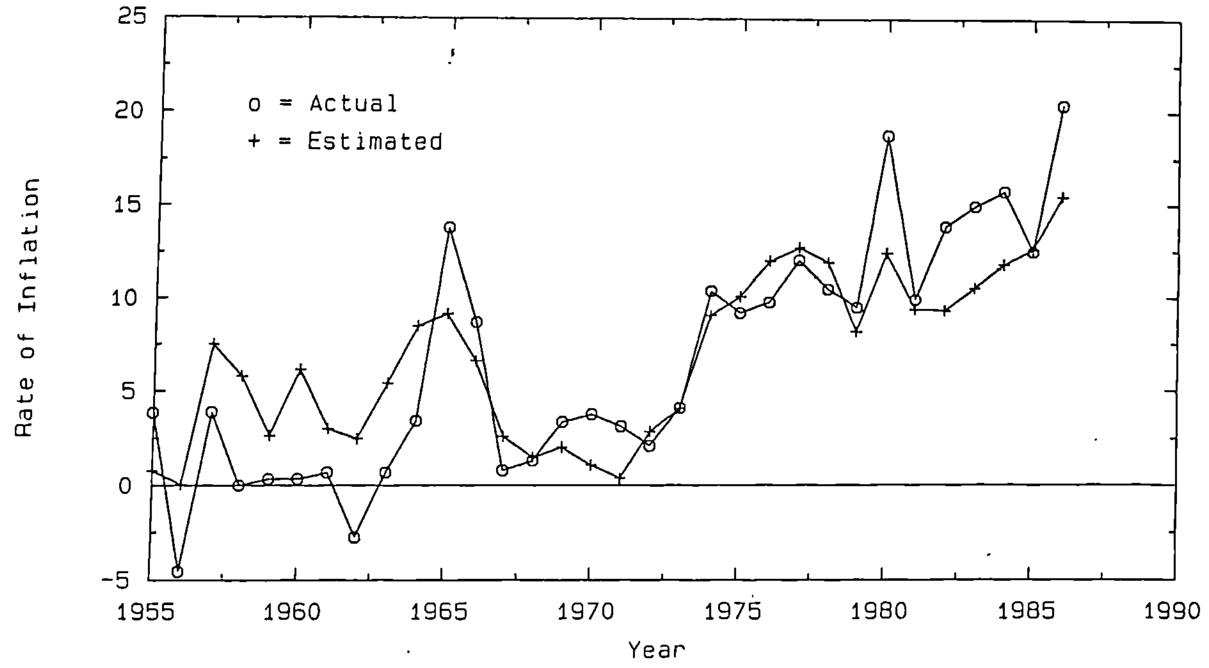

Figure 8.3: Actual And Estimated Rate of inflation.

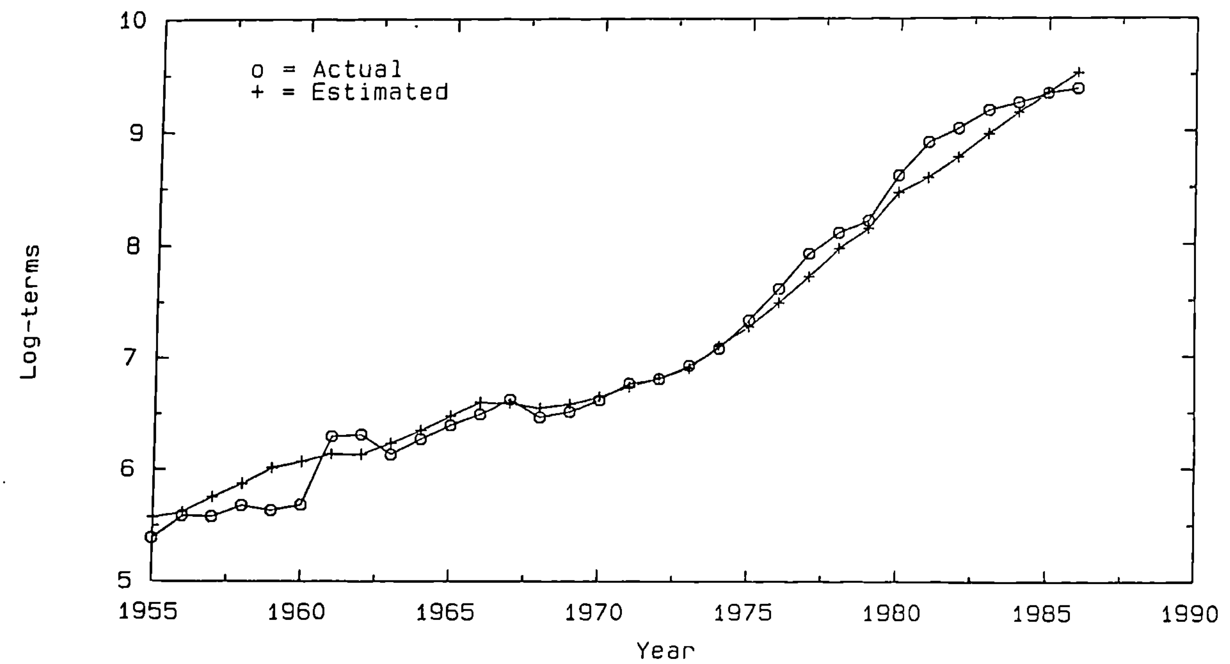

Figure 8.4: Actual and Estimated Government Revenue

Table 8.1: Simulation diagnostics of the Dependent Variables

Diagnostics	m	EXP	y	x	im	p	GT	M
1. Correlation coefficient	.991	.986	.991	.910	.966	.883	.995	.994
2. Root mean squared error	.084	.135	.081	.223	.145	.030	.132	.216
3. Theil's inequality coefficient (U)	.001	.001	.0003	.004	.0014	.109	.0003	.001
4. Theil's partial inequality proportion coefficients:								
(a) Bias proportion (U^m)	.001	.006	.002	.007	.005	.001	.002	.017
(b) Variance proportion (U^s)	.015	.493	.261	.494	.306	.216	.092	.507
(c) Covariance proportion (U^c)	.984	.501	.737	.499	.688	.783	.906	.476

Theil's inequality coefficient (U^2), measures the accuracy of the simulation. This coefficient lies between zero and 1. A value of unity indicates no correspondence between the actual and the predicted values of the dependent variable, a zero value indicates a perfect correspondence(see Theil, 1966). As a consequence, the closer the value of U^2 to zero the more accurate the tracking behaviour of the model to be. The Theil's inequality coefficient, U^2, is calculated in the following form:

$$U^2 = \frac{\Sigma(P_i - A_i)^2}{\Sigma A_i^2}$$

Where:

P_i = predicted changes.

A_i = realized (observed) changes.

Additionally, table 8.1 contains a decomposition of the U^2 into three inequality proportions: bias proportion, U^m, variance proportion, U^s, and covariance, U^c. The value of U^m and U^s should be as close to zero as possible and the U^c close to unity. In other words, the value of the three proportions should be unity. These partial coefficient are calculated in the following forms:

$$U^m \text{ (Bias Proportion)} = \frac{(P^- - A^-)^2}{1/n\ (P_i - A_i)^2}$$

$$U^s \text{ (Variance proportion)} = \frac{\Sigma\ (S_p - S_A)^2}{1/2(P_i - A_i)^2}$$

$$U^c \text{ (covariance proportion)} = \frac{2(1 - r)S_p\ S_A}{1/2\ \Sigma(P_i - A_i)^2}$$

Where:

P^- = means of predicted changes.

A^- = means of observed changes.

S_p = standard deviation of predicted changes.

S_A = standard deviation of observed changes.

r = the correlation coefficient of predicted and observed changes.

The value of these three proportions, as shown in the table 8.1 above, are all satisfactory as well as the U^2 and the root mean squared errors.

8.5 CONCLUSIONS

In order to explain changes in prices, output and balance of payments in the Egyptian economy during the period 1952-86, an attempt is made in this chapter to construct a general and highly aggregated macroeconomic model. Unlike the IMF approach, the present model allows supply and demand factors to influence real output, and hence does not constraint aggregate demand. This model also show the role of both monetary and fiscal policies.

The model has been estimated simultaneously using the most efficient estimator, i.e FIML. Estimated results as well as simulation of the historical behaviour of the model are reasonably well. Some implications can be drawn, e.g. exports in Egypt appear to be capacity constrained, and interest rate has become important in the demand for money equation. However, we cannot claim that this model is fully applicable because some equations need more investigation, such as inflation, exports and imports, and money supply. Also, there was data inadequacy which we had to face by constructing several variables as proxies. However, the model here gives the base for further quantitative studies, which are rare in the case of a single developing country.

CHAPTER 9

CONCLUSIONS AND POLICY IMPLICATIONS

The objective of this study has been to examine empirically the relevance of the IMF approach to macroeconomic adjustment in Egypt. The main conclusions that can be drawn are summarized in this chapter.

The persistent deficit in BOP and rapid inflation in most LDCs are diagnosed by the IMF staff missions to these countries as a result of expansionary domestic demand policies. Therefore, the Fund adjustment programme to countries experiencing a fundamental BOP disequilibrium is, to a large extent, a standard package of policies that concentrates on curbing aggregate domestic demand via monetary and fiscal restraint. Thus, the Fund policy package ignores the impact of any external shocks on the country's BOP.

It has been shown that the Fund adjustment programme has been based on an underdetermined model developed by Fund staff in the 1950s. Despite the explicit inclusion of two equations for inflation and output growth in the modern version of the Fund approach, the growth of output is still taken to be determined by supply factors only. Furthermore, the Fund adjustment programme is still giving more emphasis to demand constraint policies. Thus, achieving output growth under such an approach is doubtful.

An evaluation of Fund adjustment programmes implemented in developing countries using cross-section study is found to be biased, as this kind of study does not represent the behaviour of an individual country. Furthermore, the methods of evaluating such programmes include other sources of bias such as ignoring the effect of any factors other than the programme's policies in the before-after approach, and the bias in selecting the control group countries.

The evaluation methods which may not have these defects are the simulation method and testing the impact of some policy measures, but it is found that these are either not applicable to an individual country because of the unavailability of data or unsatisfactory in some countries (see chapter 3). Moreover, their simulations have indicated an adverse effect of the Fund programme on output growth. Despite these defects, a survey of outcomes of the implementation of the Fund programmes in LDCs does not explicitly show conclusive empirical evidence that such policies have been generally successful.

This study has adopted a different approach to assess the relevance of the Fund approach in an individual developing country. This has been done by testing the main assumptions of the Fund approach to macroeconomic adjustment in the context of the economy of Egypt. Chapter 4 examines the response of Egypt's aggregate exports and imports to relative price changes, and hence to devaluation. It is found that demand for Egypt's exports is inelastic in world income, which implies that if world income grows, Egypt will capture only a small percentage of world export growth. On the contrary, unlike the pessimistic view of price inelastic demand for exports in some developing countries, Egypt does not face price inelastic demand for her exports as the relative price elasticity is close to unity.

It was found that the export equation, which includes world prices and export prices separately best fits the Egyptian data. Thus, price elastic demand for exports may indicate that devaluation could be an effective policy instrument to stimulate exports. However, for this to be so the supply of exports should be elastic.

The theoretical relationship between quantity and prices of exports is found to be wrongly signed. This implies either that export prices are determined independently of quantities, or Egypt is a price taker, but lack of data for some variables, such as unit cost and capacity utilization rates, prevented proper testing.

However, testing the small country hypothesis, using the income trend and the deviation from that trend as proxies of capacity and capacity utilization, has shown that Egypt's export prices are determined by the demand side factors, but the problem of negative price coefficient remains in the determination of the quantity of exports.

On the import side, it is found that the income elasticity of demand is above unity, while the relative price elasticity is less than unity. This implies that imports will rise more than proportionately with domestic income growth. In contrast, a devaluation will lead to a small proportionate decrease in the value of imports. However, the elasticity of domestic prices is higher than that of import prices. This indicates the existence of opportunities of substituting imports with domestically produced goods. The supply of imports is best considered as infinitely elastic, as Egypt's imports represent a small proportion of world imports. Also, the empirical evidence does not support the theoretical relationship (positive) between quantities and prices. But, there is some support for Egypt being an import price taker.

Since the early 1970s, the money supply in Egypt has been growing very rapidly. This was coupled with increasing bank credit to government sector, but the share of the private sector in total domestic credit has risen, especially after the inception of the liberalization policy (the open-door economic policy). It has been found that the usual monetary policy instruments were hardly used by the authorities to control the money supply, but it seems they were accommodated to provide the quantity of money demanded. Thus, it can be concluded that the money supply in Egypt is best considered endogenous, and the quantity of money is mainly demand determined. Therefore, the supply of money in Egypt does not satisfy the assumption of exogeneity of the Fund approach.

This conclusion strengthens the need for examining the stability of the demand for money function, which is a key assumption in the Fund approach. Two distributed lag models have been developed and estimated. The first is the stock adjustment-adaptive expectations model. The general version of this model in which the demand for real money balances is specified as a function of expected real income, y^e_t, the interest rate, r_t, and the expected rate of inflation, $\dot{p}^e_t$. The equation was also adjusted for second order autoregressive distribances. It is found that expectations of income and inflation have significantly affected the demand for narrow money (M1).

The second model is the error correction model, in which the demand for real money balances is expressed in the logarithms of the first difference. It is also a dynamic model mostly applied to developed countries. Regression estimates of this model show that changes in income, inflation and interest rate significantly affected the demand for real money balances. However, this model does not deal explicitly with expectations.

Regression estimates of the two models, however, have shown that the narrow money (M1) equation is superior to that of broad money (M2 or M3). The income elasticity in the first model is very high and the same result holds for the second model. However, similar results were found in other developing countries. The stability tests of the two models have shown that the demand for money function in Egypt is stable. Also, the simulation results have shown that the two models track the behaviour of real money balances during the sample period reasonably well.

In chapter 7 the IMF assumption of exogenous money supply was followed to examine the Fund's view that inflation is a monetary phenomenon caused by excess supply of money. Theories of inflation, especially monetarist and structuralist theories, that most applied to LDCs were examined. According to empirical evidence based on these theories, it is difficult to conclude that inflation in LDCs is solely caused by either monetary or structural factors. This conclusion does also hold in the case of inflation in Egypt. Therefore, an alternative broad hybrid model that includes real, monetary, structural and expectations factors was developed and estimated for Egypt. Results indicate that all these factors combine to affect inflation in Egypt.

However, it is found that the change in the money supply does not immediately affect inflation, but it does so after long lag (two years). Unlike Teleb (1985), it was found that the structural bottlenecks in the foreign trade and agricultural sectors affected inflation in Egypt, but only the variable of foreign trade sector is significant. This finding can be attributed to the fact that Teleb's sample period covers the period of severe reduction in the supply of agricultural production. He also used the rate of change in world prices as a proxy for the foreign trade sector bottleneck instead of using the change in import prices. In contrast, during our sample period (1952-86) there was excess supply in the agricultural production till the early 1960s.

As an extension to the broad model of inflation we also estimated a monetary model for inflation in an open economy. Results have shown that the world inflation has significantly affected the domestic rate of inflation, but not the excess supply of money. Therefore, it cannot be concluded that inflation in Egypt is primarily a monetary phenomenon or mainly caused by excess supply of money as the IMF approach assumed.

Using the above identified equations for exports, imports, demand for money, supply of money, inflation, with an equation for output that depends on both supply and demand factors, an attempt is made in chapter 8 to construct a highly aggregated dynamic macroeconomic model to explain changes in prices, output and balance of payments in Egypt over the considered period.[1] Estimated coefficients of most variables are as predicted and are significant. Simulation results indicate that the model tracks the historical behaviour of

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[1] For the whole model, see appendix D.

dependent variables reasonably well. Furthermore, the model indicates some of the structural problems in the Egyptian economy, such as the export supply constraint. However, the applicability of such modelling study depends on the accuracy of the data used in estimation. Also, further disaggregated studies are needed.

The main purpose of any study is to derive some policy implications that may guide policy makers to adopt some policies that may lead to improving the performance of the economy. In the following some policy implications are summarized:

(i) It has been shown that the source of disequilibrium in Egypt's BOP is the increasing deficit on trade balance. The empirical study of export demand function indicates that world demand for Egypt's exports is elastic in prices. Therefore, devaluation can be used to enhance the demand for exports, and hence export earnings. This, however, can take place if, and only if, Egypt has an elastic export supply. It was found, from the study of export supply function, that the relationship between prices and quantity is wrongly signed. This casts doubt on the ability to increase exports unless their supply can be increased. Further work is needed to examine the appropriate export supply specification.

(ii) On the export side also, where a large part of export earnings is accounted by exhaustible resources, i. e. oil, or out of transfers that may not be available in the future, i.e. workers' remittances, there is a very serious need for adjustment in the export structure towards the traded goods sectors.

(iii) The trade balance can be improved by a reduction in imports. Regression results indicate that the demand for imports in Egypt is inelastic in prices, and hence devaluation will lead to less than proportionate decrease in imports. Nonetheless, the substitution elasticity between domestic goods and imports is high. This indicates some possibility of substitution of domestic goods for imports, but further work is needed to determine which goods can be produced domestically.

Also the availability and mobilization of domestic sources need investigation. Furthermore, the empirical evidence indicates that the income elasticity of demand for Egypt's imports is above unity. This implies that any increase in GNP will lead to higher proportionate increase in imports. Therefore, the authorities could employ some restrictions on imports of unnecessary commodities or on those which have domestic substitutes. Other measures could be used, such as imposing high duties on imports of durable commodities. This will increase government revenues, and hence the budget deficit will be reduced.

(iv) For control of inflation in Egypt, control over money supply is not sufficient, but an increase in real output growth is necessary. It is also required that sectoral bottlenecks in foreign trade and agricultural sectors to be overcome.

Finally, it is found that the type of the Fund model may not be appropriate for macroeconomic adjustment in the case of Egypt, as empirical results appear not to support three assumptions of the Fund model, namely devaluation, money supply and inflation.

Furthermore, taking real output as exogenous, as in the old version of the Fund model, or predetermined, as in the modified version, is not appropriate. Reducing inflation and restoring balance of payments equilibrium depend not only on reducing demand but also require output growth. Therefore, the attempt by this study to model the Egyptian economy with money supply as endogenous and output as determined by both demand and supply factors is a step forward to an alternative of the Fund model. However, further study is needed on some variables, as mentioned above.

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APPENDICES

APPENDIX A
FORMS OF THE IMF CREDIT FACILITIES

The various credit facilities under which members can draw from the Fund take different forms. These forms can be divided according to the degree of conditionality attaches to them. Conditionality can be defined as any measures that the Fund insists should be included in the programmes for correcting balance of payments problems.

The Fund credit facility, then can be identified with three main tranches as follows:

1. **Reserve Tranche**: That is the portion of a member's quota, which is held by the Fund in Special Drawing Rights (SDRs) or other reserve assets. This part is owned by the member who can use it as of right, without schedule of repayment or policy conditions. It is also free of interest and service charges.

2. **Low Conditionality Facilities**: That are required a member to demonstrate that it has balance of payments difficulties and it is required to present reasonable effort to overcome its payments problems. The low conditionality facilities contain a number of credit facilities summarized in the following:

(i) **The Compensatory Financing Facility (CFF)**, this was introduced in 1963, to assist members, especially primary product countries, experiencing BOP difficulties due to shortfalls in export receipts. This facility was extended in 1980 to include assistance for members facing BOP problems attributed to excess in the cost of cereal imports. The overall drawing under both export shortfalls and cereal import excesses is subject to a ceiling of 125 percent of quota.

(ii) **The Buffer Stock Financing Facility (BSFF)**, which was set up in 1969, is to make the credit available to members with BOP difficulties as a result of their participation in international buffer stock arrangements; a member can draw under this facility up to 50 percent of quota.

(iii) **The Credit Tranche Policy** (or the First Credit Tranche), which is usually referred to as the Fund basic financing policy. The credit under this policy is available in tranches. Each tranche is equal to 25 percent of quota (increased to 36.25 % in January 1976). The credit tranche facilities may be made outright of under a stand-by arrangement, normally for one year of for as long as three years (IMF,1982, p. iv).[1] Accordingly, the credit tranche include credit tranche ordinary resources.

(vi) **Oil Facilities (OF)**, these were established in 1974 to provide assistance to members with BOP problems as a result of the rise in oil prices. these facilities were terminated in 1976.

3. **High -Conditionality Lending**: This provides a source of finance for a member with BOP difficulties. Under these facilities a country is required to adapt a stabilization

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[1] A stand-by arrangement can be identified with a line of credit which gives the member "an assurance" that during a given period that it will be able to use the Fund's resources up to specific amount as long as it is implementing the Terms of arrangement (IFS, Supplement, 1982).

programme approved by the Fund management, These lendings include the following facilities:

(i) **The Extended Fund Facility (EFF),** which was introduced in 1974, is to provide assistance for a longer period and in a bigger amount than the credit tranche, to members that facing BOP difficulties that needs structural changes in prices, production, and trade. These facilities are available in instalments over a period of three years.

(ii) **The Supplementary Financing Facility (SFF)**, this was set up in 1979 to assist members with BOP difficulties that are large in relation to their fund quotas and their economies. The credit under this facility is associated with high credit tranche stand-by and extended arrangements. Because of the available sources for this facility are borrowed from other member countries, a high interest rate should be paid. However, the cost of interest rate of such credit was subsidized for low-income LDCs, through a subsidy account which was established for this purpose.

(iii) **The Enlarged Access to the Fund's Resources (EAR),** was introduced in 1981 under the same commitment as SFF. There is no interest rate subsidy policy under this facility, and the amount of credit is determined according to guidelines adopted by the Fund from time to time.

(vi) **The Structural Adjustment Facility (SAF)**, which was established in March 1986 to provide assistance to low-income developing countries that are facing acute BOP difficulties, and which undertake structural adjustment programmes.

(iv) **The Enlarged Structural Adjustment Facility (ESAF)** was introduced in December 1987 to provide additional assistance to low-income developing countries undertaking growth-oriented adjustment programmes.

In addition to the above facilities, the Fund allocates SDRs to members that are participants in the SDRs Department in proportion to their quota. SDRs were made as unconditionalled reserve assets to supplement existing reserve assets. The first allocation of SDRs are made in 1970. Industrial countries, however, have accounted for the major share. There is also the Trust Fund, which was established in 1976 to provide BOP assistance on concessional terms to developing countries. The sources of the Trust Fund were derived from profits from sales of a proportion of the Fund's gold stock.

The distribution of the total credit presented by the Fund among LDCs and Industrial countries shows that the credit has swung towards LDCs since the early 1970s. In the 1980s LDCs became the main users of the Fund credits, as shown in the following table.

Table A.1

Accumulated Use of the Fund Credit by LDCs and Industrial Countries

Million of SDRs

Periods	Total	Industrial Countries		LDCs	
		value	% of Total	Value	% of Total
1952-56	924	497	53.8	427	47.2
1957-61	4230	1871	44.2	2359	55.8
1962-66	9526	4547	47.7	4979	52.3
1967-71	14747	9192	62.3	5555	37.7
1972-76	25892	10471	40.5	15421	59.6
1977-81	46907	13852	29.5	33053	70.5
1982-85	119990	194	0.2	119796	99.8

Source: IFS Yearbook, IMF,1986,pp. 34-35.

Table A.2: Economic Policies Employed in 94 IMF Financial-Supported Programmes (1980-84)*

Policies	Number of Programmes	% of Total Programmes
Limitation on credit expansion	92	98
Restraint of central government current expenditure	86	91
External debt policies	86	91
Measures affecting wages and prices	83	88
Structural adjustment measures	70	74
Domestic tax on goods and services	69	73
Restraint on wages and salaries	59	63
Restraint on capital outlays and net lending	56	60
Improve or reform of tax adminstration	52	55
liberalization and reform of exchange rate management	52	55
Measures to mobilize domestic savings	51	54
Import duties	51	54
Restructuring of personal income tax	43	46
Improved expenditure adminstration	40	43
Capping or reduction in subsidies	39	41
Measures affecting corporate tax	32	34
Curtailment of current transfers of NPT(a)	26	28
Export duties	23	24
Restrictions on Central government functional expenditure	4	4

* policies are rearranged according to their relative importance in total programmes.
(a) Nonfinancial Public Enterprises.
Source: Sisson (1986. p. 34).

APPENDIX B

DATA DEFINITION AND SOURCES FOR FOREIGN TRADE (CHAPTER 4)

All data are annual for the period 1952-86, and were obtained from the following sources:

(1) IMF IFS,Yearbook, Various Issues.
(2) Direction of Trade, IM, Various Issues.
(3) OECD, National Accounts: main Aggregates, and Main economic Indicators, Various Issues.
(4) UNCTAD, Handbook of International Trade and Development Statistics, Issues of 1972,1981, 1986, and 1988.
(5) UN, Yearbook of International Trade Statistics, Various Issues.

All the data were defined in chapter 4, but some variables were generated to be used in estimating the demand for and supply of exports and imports. A summary of definitions and generated variables is presented as follows;

(1) Quantities of Exports and imports: data about Egypt's quantity and prices of exports and imports are very rear. It is very difficult to obtain a series for the sample period from most of national and international statistical sources. However, data for these variables were taken from source (4) above, with a unification of the base year to be 1980. According to this source, the quantity index of exports (or imports), is defined as the ratio of export to import) value index to the corresponding unit value index. Values indices and unit value indices were obtained also from source (4). It is to be noted that Values of indices are based on current values of exports (f.o.b) or imports (c,i,f) converted to dollars.

(2) Domestic real GNP is current GNP deflated by consumer price index (CPI). Domestic income trend (TY is calculated by fitting a linear-time trend to logarithms of real GNP.. The logarithms of the Deviation of income from trend (CY is calculated as the difference of GNP from the trend of GNP (all variables are in index numbers).

(3) OECD real GDP is the current GDP deflated by OECD GDP deflator. The trend of OECD real GDP (wty) and the deviation from trend (cwy) are calculated as those of domestic TY and CY, above. Data on OECD GDP and its deflator are taken from Source (3).

(4) Exchange rate is expressed as units of US dollar per unit of Egyptian pound, obtained from Source (1). Two nominal effective exchange rates are calculated: Average export-weighted index, and average import-weighted index, using 1980 as a base year. Export or import weights are calculated as the major partner's shares in total exports or imports of Egypt. Nine main trade partners are chosen, excluding LDCs and Eastern Countries, are: Belgium, France, Italy, Japan, Netherlands, Spain, West Germany, U,K, and U.S.A. Thus, following Rhomberg (1976) average export-weighted nominal exchange rate is calculated as follows:

$$NEER = \Sigma_{j=1}^{9} (X_{Ej} / \Sigma X_{Ej})\ RE_{Ej}$$

Where:

R_{Ej} = R_j/RE_{Ej};

R_j = the value of one unit of trading-partener j currency in terms of US dollar (expressed as index number).

R_E = the value of one Egyptian pound in terms of US dollar (in index number terms).

X_{Ej} = Egypt's exports to country j.

Average import-weighted index is calculated using the same formula, but with IM_{Ej} as Egypt's imports from country j. Data on exports to and imports from main trading-partner were taken from sources (2) and (5), above. Exchange rates of the nine countries are annual average obtained from source (1) and IFS, Supplement on Exchange Rate.

The real effective exchange rate (REER) index can be obtained by deflating the NEER index by trade weighted relative price as follows;

$$REER^t = \frac{NEER^t}{TWP_t}$$

Where:

$$TWP_t = (X_{Ej} / \Sigma X_{Ej}) \frac{CPI_{Et}}{WPI_{jt}}$$

CPI_{Et} = Egypt's consumer price index at period t.

WPI_{jt} = country's j wholesale price index at period t.

APPENDIX: C

Table C.1: Structural parameters of demand for money: Stock Adjustment-expectations, Model I (eq.1.14)

Reduced Form Parameters	Structural Parameters
A_0	$= d_1\ a_0\ (1- c_1)\ (1 - c_2)\ (1 - b_1)\ (1 - b_2)$
A_1	$= (c_1- c_2 + 3 - d_1 - b_1 - b_2)$
A_2	$= [c_1c_2 + (c_1 + c_2)(3 - d_1 - b_1 - b_2) + (2 - d_1 - b_1)(1- b_2) + (1 - d_1)(1 - b_1)]$
A_3	$= [(c_1 + c_2)(1 - d_1)(1 - c_1) + (c_1 + c_2)(2- d_1 - b_1)(1 - b_2) + c_1(1 - d_1)(1 - b_1)(1 - b_2) + c_1c_2(3 - d_1 - b_1 - b_2)]$
A_4	$= -[(c_1 + c_2)(1 - d_1)(1 - b_1)(1 - b_2) + c_1\ c_2\ (1 - d_1)(1 - b_1) + c_1\ c_2(2- d_1 - b_1)(1 - b_2)]$
A_5	$= [c_1\ c_2\ (1 - d_1)\ (1 - b_1)\ (1 - b_2)]$
A_6	$= d_1\ a_1\ b_1$
A_7	$= -[d_1\ a_1\ b_1\ (c_1 + c_2 + (1 - b_2)]$
A_8	$= [d_1\ a_1\ b_1\ (c_1\ c_2 + c_1 - c_1\ b_2 + c_2 - c_2\ b_2)]$
A_9	$= -[c_1\ c_2\ d_1\ a_1\ b_1\ (1 - b_2)]$
A_{10}	$= d_1\ a_2$
A_{11}	$= -[d_1\ a_2(c_1 + c_2 + (2 - b_1 - b_2)]$
A_{12}	$= [d_1\ a_2\ (c_1\ c_2 + (1- b_1)(1 - b_2) + (c_1 + c_2)(2- b_1 - b_2)]$
A_{13}	$= -[d_1\ a_2\ (c_1\ c_2\ (2 - b_1 - b_2) + (c_1 + c_2)(1 - b_1)(1 - b_2)]$
A_{14}	$= [c_1\ c_2\ d_1\ a_2\ (1- b_1)\ (1 - b_2)]$
A_{15}	$= d_1\ a_3\ b_2$
A_{16}	$= -[d_1\ a_3\ b_2\ (c_1 + c_2) + (1 - b_1)]$
A_{17}	$= [d_1\ a_3\ b_2\ (c_1 + c_2)\ (1 - b_1) + c_1\ c_2]$
A_{18}	$=- c_1\ c_2\ d_1\ a_3\ b_2\ (1 - b_1)$
A_{19}	$= d_1\ a_4$
A_{20}	$= - [d_1\ a_4\ (c_1 + c_2) + (2 - b_1 - b_2)]$
A_{21}	$= [d_1\ a_4\ (c_1 + c_2)(2 - b_1 - b_2) + (1 - b_1)(1 - b_2) + c_1\ c_2)]$
A_{22}	$= - [d_1\ a_4\ (c_1 + c_2)\ (1- b_1)(1- b_2) + c_1\ c_2\ (2 - b_1 - b_2)]$
A_{23}	$= (c_1\ c_2\ d_1\ a_4\ (1 - b_1)\ (1 - b_2)]$

Table C.2: Structural Parameters of Demand for Money: Stock Adjustment-expectations, Model II (eq.6.16)

Reduced form parameters		Structural parameters
B_o	=	$a_o\ d_1(1 - c_1)\ (1 - b_1)$
B_1	=	$[(1 - b_1) + (1 - d_1) + c_1]$
B_2	=	$-(1 - b_1)\ (1 - d_1)$
B_3	=	$c_1\ (1 - b_1)\ (1 - d_1)$
B_4	=	$d_1\ a_1\ b_1$
B_5	=	$-\ c_1\ d_1\ a_1\ b_1$
B_6	=	$d_1\ a_2$
B_7	=	$-\ d_1\ a_2\ [\ (1 - b_1\ ) + c_1\ ]$
B_8	=	$c_1\ d_1\ a_2\ (1 - b_1)$
B_9	=	$d_1\ a_3$
B_{10}	=	$-\ d_1\ a_3\ [\ (1 - b_1) + c_1\ ]$
B_{11}	=	$c_1\ d_1\ a_3\ (1 - b_1)$
B_{12}	=	$d_1\ a_4$
B_{13}	=	$-\ d_1\ a_4\ [\ (1 - b_1) + c_1\ ]$
B_{14}	=	$c_1\ d_1\ a_4\ (1 - b_1)$

Table C.3: Structural parameters of Demand for Money: Stock Adjustment-Expectations, Model III (eq. 6.17)

Reduced form parameters		Structural Parameters
C_o	=	$d_1\ a_o(\ 1 - c_2)\ (1 - b_2)$
C_1	=	$[\ (1 - d_1) + (1 - b_2\ ) + c_2\ ]$
C_2	=	$-[(1 - d_1)(1 - b_2) + c_2(1 - d_1) + (1 - b_2)]$
C_3	=	$c_2(1 - d_1)\ (1 - b_2)$
C_4	=	$d_1\ a_1$
C_5	=	$-\ d_1\ a_1\ [\ (1 - b_2) + c_2\ ]$
C_6	=	$c_2\ d_1\ a_1\ (1 - b_2)$
C_7	=	$d_1\ a_2$
C_8	=	$-\ d_1\ a_2\ [\ (1 - b_2) + c_2\ ]$
C_9	=	$c_2\ d_1\ a_2\ (1 - b_2)$
C_{10}	=	$a_3\ ^2$
C_{11}	=	$-\ c_2\ d_1\ a_3\ b_2$
C_{12}	=	$d_1\ a_4$
C_{13}	=	$d_1\ a_4\ [\ (1 - b_2\ ) + c_2]$
C_{14}	=	$c_1\ d_1\ a_4\ (1 - b_2)$

Table C.4: Structural Parameters of demand for money: Stock Adjustment-Expectations, Model VI (eq. 20)

Reduced form parameters	Structural Parameters
D_0	$= d_1\ a_0(1 - c_1)(1 - b_1)$
D_1	$= ((1 - d_1) + (1 - b_1) + c_1)$
D_2	$= -((1 - d_1)(1 - b_1) + c_1((2 - d_1 - b_1))$
D_3	$= c_1\ (1 - d_1)(1 - b_1)$
D_4	$= d_1\ a_1\ b_1$
D_5	$= -c_1\ d_1\ a_1\ b_1$

DATA SOURCES OF CHAPTERS 5 AND 6

Time series annual data for all variables over the study period, 1952-1986, are obtained from the IMF publication, IFS, various issues. There is no conclusive evidence, neither theoretical nor empirical whether broad or narrow definition of money is preferable. Where Friedman's empirical work is based on a definition of money, which includes currency in circulation, demand deposits,and time deposits in commercial banks (Friedman, 1959,p.328). Meltzer (1963), however, has pointed out that the definition of money is an open question. His empirical work is based on three various definitions of money, namely:

M1 = currency + demand deposits,
M2 = M1 + time deposits at commercial banks,and
M3 = M2 + saving deposits.

In the present study the IFS' definition of money is employed for testing the demand for money function. This definition is specified as follows:
M1 = money,
M2 = M1 + quasi-money, and
M3 = M2 + quasi-monetary liabilities.

Where money is currency in circulation plus demand deposits in commercial banks. Quasi-money includes time and saving deposits in commercial banks. Quasi-monetary liabilities are time and saving deposits of other financial institutions,for example specialized banks in Egypt, including post office saving deposits. M3 includes import deposits, which were introduced in the last three years of the study period. It can be pointed out that the IFS' definition of money is virtually similar to that of Meltzer.

As regarding the Central Bank of Egypt's definition of money, it has been found that M1 is similar to the above definition,i.e. M1 includes currency in circulation plus private demand deposits. M2 equals to M1 plus quasi-money,which includes time and saving deposits,and private demand deposits in foreign currency,plus the post office savings (NBE,1985).

The nominal money balances are deflated by the consumer price index (CPI) to obtain the real money balances. Real income figures are obtained as the gross national product (GNP) deflated by CPI. Nominal GNP figures for the period 1952 - 1960 are taken from Mead (1967), and for the rest of the study period form IFS. CPI are unified as 1980 is the base year.

The price level is measured by CPI. The actual rate of inflation is obtained as the first difference in the natural log of the consumer price index. Reasons for using CPI rather than other price indicators are: 1) GNP deflator for Egypt is not published; 2) CPI has been used as a deflator by previous studies (Crockett and Evans, 1980, and Teleb, 1985); and 3) it has been concluded that CPI is generally superior to the wholesale price index in estimating the demand for money function (Teleb, 1985). Finally, the interest rates variable is represented by the central bank discount rate.

Data on the components of the monetary base (GC, BC and NFA) are obtained from IMF, IFS, Various Issues. The money multiplier is measured by dividing the money supply, M1, M2 and M3 by the monetary base. Data on currency in circulation, on demand deposits and on time and saving deposits of commercial banks are obtained from various **Yearbooks of IFS.** The net foreign assets are taken as the central bank foreign assets minus its foreign liabilities. This variable is was negative for 25 observations of the sample period. In order to estimate the supply money equation in logarithmic terms, NFA is calculated as a residual of the logarithm of the monetary base minus the logarithm of the domestic component of the monetary base (GC + BC). The change in NFA then is obtained as

$$\log\left(1 + \frac{NFA_t - NFA_{t-1}}{NFA_{t-1}}\right).$$

This formula is employed by Khetan and Waghmare (1971). Data on government expenditure and revenues are obtained for the 1952-62 period from Mead (1967), for period 1963-78 from Ikram (1980) and for the rest of the sample period, data are obtained from IFS. Finally, interest rate in the unorganized money market is measured as the interest rate in the organized money market plus the expected rate of inflation (Park, 1973).

APPENDIX: D

THE MACROMODEL IN CHAPTER 8

$$LnEXP^* = a_o + a_1 \ln y_t + a_2 \left(\ln \frac{M}{p_{t-1}} - \ln \frac{M^*}{p}\right) \tag{8.1}$$

$$D \ln EXP_t = B_1 (\ln EXP^* - \ln EXP_{t-1}) \tag{8.2}$$

$$Lnx^*_t = b_o + a_3 \ln yw_t + a_4 \ln\left(\frac{px.e}{wp.e}\right)_t \tag{8.3}$$

$$D \ln x_t = B_2 (\ln x^* - \ln x_{-1}) + a_5 \ln(y/y^t) \tag{8.4}$$

$$LnIm^*_t = c_o + a_6 \ln\left(\frac{pm.e}{pd}\right)_t + a_7 \ln y_{t-1} \tag{8.5}$$

$$D \ln Im_t = B_3 (\ln Im^* - \ln Im_{-1}) \tag{8.6}$$

$$Lny^*_t = d_o + a_8 \ln AEXP^e_t + a_9 \ln IM^e_t \qquad (8.7)$$

$$LnAEXP^e_t = c_1 \ln AEXP_t + (1-c_1) \ln AEXP^e_{t-1} \qquad (8.8)$$

$$LnIm^e = c_2 \ln Im_t + (1-c_2) \ln Im^e_{t-1} \qquad (8.9)$$

$$D \ln y_t = B_4 (\ln y^*_t - \ln y_{t-1}) \qquad (8.10)$$

$$Lnm^*_t = e_o + a_{10} \ln y^e_t + a_{11} \ln r_t + a_{12} p^{\cdot e}_t \qquad (8.11)$$

$$Lny^e_t = c_3 \ln y_t + (1-c_3) \ln y^e_{t-1} \qquad (8.12)$$

$$Lnp^{\cdot e}_t = c_4 p^{\cdot}_t + (1-c_4) p^{\cdot e}_{t-1} \qquad (8.13)$$

$$D \ln m_t = B_5 (\ln m^*_t - \ln m_{t-1}) \qquad (8.14)$$

$$D \ln p_t = f_o + a_{13} \ln(\frac{wp.e}{p}) + a_{14} \ln AGR_t + a_{15} D \ln p_{t-1} \qquad (8.15)$$

$$LnT^* = g_o + a_{16} (\ln y_t + \ln p_t) \qquad (8.16)$$

$$D \ln T_t = b_6 (\ln T^*_t - \ln T_{t-1}) \qquad (8.17)$$

$$D DC_t = D GC_t + D CP_t \qquad (8.18)$$

$$D DC_t = D (G - T) + D CP_t \qquad (8.19)$$

$$M^s_t = R_t + DC_t \qquad (8.20)$$

$$LnM_t = h_o + a_{17} \ln R_t + a_{18} (G - T)_t + a_{19} \ln CP_t \qquad (8.21)$$

$$D R_t = D M_t - D DC_t \qquad (8.22)$$

The Endogenous Variables are:

EXP = real expenditure (private consumption plus investment)
X = real exports
IM = real imports
y = output (real GNP)
m = real money balances
p = domestic prices (CPI)
T = Government revenues (nominal)
M = nominal money supply
DC = domestic credit
R = international reserves (Egyptian pounds)

The Exogenous variables are:

yw = real world income (proxied by OECD GDP)
g = real government current spending
px = export price index
pm = import price index
wp = world prices (proxied by OECD WPI)
y^e = expected real GNP
p^e = expected rate of inflation
$AEXP^e$ = expected aggregate expenditure (C+I+g+x)
IM^e = expected imports
r = interest rate
e = exchange rate (units of Egyptian pound per unit of U.S. dollar)
G-T = budget deficit
AGR = rate of growth of agricultural production
CP = credit to the private sector