THE MONETARY APPROACH TO THE BALANCE OF PAYMENTS: THE CASE OF THE OIL-BASED, SMALL, OPEN, DEVELOPING ECONOMIES OF LIBYA, KUWAIT AND SAUDI ARABIA

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CHAPTER I

INTRODUCTION

The discovery of oil and its exploitation by the developing economies of Libya, Kuwait and Saudi Arabia helped to ease their foreign exchange constraints. As a result, their financial needs for economic development are no longer a serious obstacle. The terms of trade were not favorable to these small oil-based open economies until the oil price adjustment of the 1970s. The moderate oil price increase of 1970-71, known as "the Tehran Agreement," which raised the average price of crude oil to $2.29 a barrel by 1972, was followed by the two major price hikes of 1973 (effective on January 1, 1974) and 1980.(1)

These oil price increases changed the structure of the world oil market, corrected the terms of trade in favor of the oil exporters and recognized the collective power of the oil producers as demonstrated by the policies of the Organization of Petroleum Exporting Countries, (OPEC). The oil price upsurge, in fact, came at a time characterized by world economic instability and, therefore, aggravated the problems facing the international financial system. It resulted in an unanticipated, substantial transfer of wealth and income from oil-consuming countries to oil-producing countries. The oil payments no doubt have been felt by most oil-importing countries in terms of high inflation, higher import bills, Balance of Payments (BOP) adversity, and a detrimental effect on their standard-of-living, especially by the

non-oil LDCs.[2] However, the oil reserves flow and the efficient recycling of these funds have had their adverse impact on all the countries of the world of which the oil-exporting countries of Libya, Kuwait and Saudi Arabia are a part. Although it lessened the problem of the availability of financial funds, the events of the 1970s created external and internal problems and contributed to the existing problems of higher inflation, resource waste, income maldistribution, sectoral imbalances, and rapid depletion of oil reserves, as well as social problems.

Statement of the Problem

The oil-induced imbalances in the external sector of these small oil-based open economies present policy issues fundamentally different from those normally associated with the process of international adjustments. Moreover, the policies conducted by the governments in order to mitigate the adverse effects of the world economic instability on the domestic economies have made the link between the internal and external economic forces more complex. Foreign exchange volatility, which followed the breakdown of the Bretton Woods Agreement, resulted in an unstable international system of payments which had its adverse effect on trade, finance and economic growth and development within the world community. All these factors indicate that the adjustment of the external oil-induced imbalance of these small open economies may not be achieved through the nonmonetarist adjustment presented by the elasticities and absorption approaches.

It should be pointed out that the oil-based developing economies of Libya, Kuwait and Saudi Arabia share common basic characteristics which

include: (i) the rudimentary nature of their financial structure, which makes the choice of wealth holdings very limited outside money and real assets: (ii) the absence of independent central banking authorities; (iii) the strict government control over interest payments; (iv) the problem of sectoral imbalances; (v) the shortages of certain labor skills, natural resources and water resources; and (vi) very limited arable land and severe dry climate. Given the above factors, in these oil-based economies, oil alone as an export oriented resource dominates almost all their economic activities. Accordingly, all three small economies are highly open to the rest of the world (ROW) through foreign trade and this makes them extremely vulnerable and sensitive to external shocks as small open economies under fixed exchange rates.

The huge oil revenues have enabled the government in each country to launch massive development programs and invest an increasing portion of the foreign reserves surpluses in long-run development projects aimed toward improving the well-being of the people, correcting the sectoral imbalances of the domestic economy and breaking down the dependency on oil. The escalated public spending has led to an important transformation in the economic structure of these developing economies. The result of the public and private spendings was a rapid increase in almost all components of the aggregate demand, as contrasted with a limited domestic production base. The logical outcome of such expansionary policies has been increasing excess demand which was satisfied by imports and increased trading links to the ROW.

This study emphasizes the problem of the foreign exchange flow in these small oil-based developing economies and its impact on the domestic economies. In other words, the adjustment process of external

imbalances in the oil-exporting economies of Libya, Kuwait, and Saudi Arabia is to be studied during a period characterized by world economic instability and a volatile international monetary system.(3)

In the existing literature there are at least three major and distinct approaches or theories to the analysis of the flow of foreign exchange. The "elasticities" and the "income-absorption" approaches, the nonmonetarist approaches, may not be considered as suitable tools for analyzing the flow of foreign reserves of the oil-exporting countries. Since both approaches use a partial equilibrium analysis and consider the BOP primarily in light of the trade balance, they either neglect the role played by money, or they consider the role of money to be of secondary importance(4) [P. G. Wilferd, (1977)]. The "elasticities" approach, by relying on exchange rate changes, is an inadequate analytical tool to study the oil-induced external imbalance because oil is highly price inelastic and paid for in dollars, not in the domestic prices of the oil exporting countries. The "income-absorption" approach, by relying on macroeconomic policies of the aggregate demand management, has limited impact on studying the oil-induced surpluses because the institutional and economic structures in these small developing oil-based economies impose limits on the level of absorption; besides, demand management is not the problem as far as the LDCs are concerned [Park, (1976)]. In brief, the nonmonetarist traditional approaches' short-run, partial equilibrium analysis presented by exchange rate changes (devaluation or revaluation) and the income policies may seem to be inadequate tools to study the problem of the foreign exchange flow of the oil-exporting countries.

The monetary approach, which is the long run general equilibrium

approach integrating the current and capital accounts into the money account or the overall balance of payments, presents itself as a suitable tool for the study of the foreign reserves flow in these oil-exporting economies. The monetary approach, which emerged from the works of Mundell (1968, 1971), Johnson (1972, 1976), Zecker (1974), Kemp (1975), Swoboda (1976) and Genberg (1976), among others, treats the flow of foreign reserves as essentially a monetary phenomenon which can be analyzed in relation to the small country's domestic money market. By defining the overall BOP or the money account as changes in the foreign reserves of the banking system, it views the BOP as an adjustment process to the small country's imbalances in its domestic money market. Thus, the monetary approach to international reserves flow provides the basis for the analysis presented in this research.

It is the purpose of this thesis to study the changes in the net foreign reserves adjustment mechanism in the oil-based small open economies of Libya, Kuwait and Saudi Arabia. This study uses a simple monetary model and relies on the domestic monetary equilibrium conditions to derive an equation of the overall BOP position of the economies. Given a fixed exchange rate system, a direct link between the BOP and the money supply process is established. Hence, any imbalance in the domestic money market will spill over into the external sector and ultimately result in a surplus or a deficit in that country's BOP. These BOP surpluses or deficits will continue until all imbalances in the money market are removed. This direct link between the BOP and the money market imbalances enables one to explain the foreign reserves flow by the changes in the variables which determine the demand for and supply of money. Therefore, an excess supply of (demand for) money

implies a BOP deficit (surplus), while a money market balance implies a BOP equilibrium. This study relies on a simple monetary model, which is a variant of the so called monetary approach to the balance of payments (MABOP). Such a model is used in the case of the small open economy under fixed exchange rates to study the adjustment process to monetary imbalances caused by exogenous factors. This basic model will be used to analyze the foreign reserves flow in these oil-exporting countries. The study is of both a theoretical and empirical nature.

The Objectives of the Study

This study, as mentioned above, uses a simple monetary model similar to the basic model developed by H. Johnson (1972) after accounting for some of the institutional constraints which are imposed by the nature of these developing oil-based economies. The model uses the monetary forces in the domestic money market to derive the version which will be referred to as the standard model of the MABOP. An econometric testing will then be conducted using data from Libya, Kuwait and Saudi Arabia. The study covers the following three major steps:

1) In the tradition of the monetary approach, the monetary characteristics of the BOP are analyzed by testing the relation between changes in net foreign reserve holdings of the central banks of Libya and Kuwait, and the Saudi Arabian Monetary Agency, SAMA, against changes in net domestic credits of these central banks and other exogenous variables. The model to be used assumes the line of causation to run from domestic credits (the money variable) to the reserves. Moreover, it assumes all basic propositions of the standard model presented by the proponents of the monetary approach hold. This basic or standard MABOP

model is empirically estimated for the case countries using the Ordinary Least Squares (OLS) estimation technique.

2) The econometric validity of the empirical results, in fact, hinges crucially on the assumption of statistical exogeneity of the right hand side variables of the single equation model of the BOP. The violation of the exogeneity assumption means the estimates of the BOP single equation are both biased and inconsistent. To avoid this problem, known as the simultaneous equation bias[5], as well as to examine for the possibility of reverse causation, the standard monetary model is modified. The modification involves the use of a simple simultaneous equation system in which domestic money is treated as an endogenous variable. A reaction function was specified to account for the behavior of the monetary authorities in these countries. Both the BOP equation and the reaction function equation were then estimated simultaneously using the two-stage least squares (2SLS) technique. The results of the estimation show that the monetary authorities in these oil-exporting developing small open economies do act to sterilize the impact of foreign reserves flow (BOP) in favor of maintaining a stable money supply.

3) The basic monetary model assumes that the "integrated market hypothesis" holds where prices in the small open economy move in line with their world counterparts. When this assumption was tested, it was rejected by the Saudi data. This calls for another modification of the standard model. The second modification allows for the presence of non-traded goods into the analysis, which is done by the introduction of a price adjustment equation. Then the model is examined for both the price and the BOP development in the context of a short-run dynamic

adjustment against a monetary disturbance. This modified model was estimated for the Saudi case using the Polynomial Estimation method (PDL).

The econometric testing of all these relations was conducted on quarterly data covering: 1970-II-1979QIV for the Libyan case, 1973QI - 1982QIV for the Kuwaiti case, and 1970II-1982QIV for the Saudi Arabian case. (For data sources see Appendix A).

The aims of the research are the following:

(1) The study aims to test the monetary relations hypothesized by the standard monetary approach to the BOP, particularly the one-to-one inverse relation between changes in the net foreign reserves (BOP) and changes in net domestic credits (net domestic assets of the central bank). It also investigates the negative relations between the BOP and the rates of change in interest rates (or expected inflation) and the money multiplier. The objective is thus to accept or reject the assumption that an increase in these variables worsens the BOP position. It also tests the assumption that the BOP relates positively to changes in prices and real income, which implies that growth in real income and prices improves the BOP position. It also aims to investigate whether the monetary authorities in the sample countries have acted so as to sterilize the impact of foreign reserves flow in favor of maintaining a stable money supply. The study also considers testing the validity of the integrated market hypothesis for the goods' market, as well as the short-run relations between domestic inflation and the BOP.

(2) This research work aims to provide a theoretical framework that could be used to analyze the various policy decisions and help

guide the policy-makers in dealing with devaluation, sterilization, credit expansion, inflation, etc.

(3) The study aims to participate in providing a building block for a consistent and more detailed open macroeconomic analysis of the small oil-based developing open economies of Libya, Kuwait and Saudi Arabia.

Organization of the Study

This study consists of seven chapters. Chapter I is a general introduction in which an overview and prospective of the dissertation is presented. It presents the problem identification, the objectives of the study and outlines the chapters of the study.

Chapter II focuses on the Libyan economy as an example for these oil-based developing small open economies. It gives special emphasis to the development of its BOP and the structure of its financial system. It shows the link between the BOP and the monetary sector in this small open economy which operates under a fixed exchange rate regime. The Libyan economy is actually a very close representation of the other two cases, the economies of Kuwait and Saudi Arabia.

Chapter III reviews the theoretical development of the monetary approach's analysis of the BOP adjustment. It utilizes a simple monetary model to derive the standard model of the BOP adjustment, building on the work of H. Johnson. The chapter then presents two methods which may be used to represent and estimate the standard model to the BOP determination. Finally, the chapter addresses the issues of policy and critique of the monetary approach to the BOP theory.

Chapter IV undertakes the empirical testing of the MABOP using data

from Libya, Kuwait and Saudi Arabia. The chapter begins the econometric testing with the standard model of the MABOP. It estimates the single equation of the BOP directly; then it estimates the demand for money in each country and uses the estimates of the demand for money balances to estimate the BOP equation indirectly. After the single equation estimation, the standard model is modified by specifying a reaction function for the monetary authorities in an effort to examine the interaction between the BOP and the monetary policies in these case countries. All the results obtained from the econometric tests are reported and the working of the proposed models is discussed.

Chapter V is an extension of the previous chapter since both chapters are considered the heart of the dissertation. The chapter undertakes the empirical testing of the integrated market hypothesis. It presents a special measure of the world inflation variable which is used in the empirical testing of the hypothesis in light of the domestic inflation in the case countries. Only the data in Saudi Arabia rejected the integrated market hypothesis. The chapter then modifies the standard model by introducing the non-traded goods sector into the analysis. The modified model then captures the short-run dynamic adjustments in prices and the BOP taken together. For the empirical testing, data from Saudi Arabia were used to estimate this modified version. The results of the estimation are reported and discussed.

Chapter VI presents a summary of the major points obtained from the empirical results and provides some concluding remarks as well.

Finally, two appendixes are presented. Appendix A contains the data sources, the technique used to generate quarterly income figures from the annual series and the method used to obtain the expected

inflation. Appendix B presents a derivation of the prices and BOP equations of Blejer's model used in Chapter V.

ENDNOTES

[1]The average price of a barrel of crude oil exported by OPEC increased from $2.29 in 1972 to $10.49 in 1974, and from $12.70 in 1978 to $31.50 in 1980. However, in the 1980's oil prices started to decline from their peak of $35.37 in 1981 to $27.00 in 1982 and fell to around $12.00 a barrel in January of 1986. The average price of crude oil then started to rise slowly and settled around $19.50 as of September of 1987. For more on this topic, see A. McGuirk (1982), S. Bell and B. Kettell (1983), chapter II and W. Mead (1986), p. 213.

[2]In fact, the energy crunch hit hard on the LDCs, but it did not affect the big industrialized countries as much since oil accounts for only about 5 percent of their expenditure. For example, in a country like Japan which imports all its oil needs, a fall in oil prices by 30 percent would cut the inflation rate by about 1.5 percent and add 1.5 percent to its real income (Bell and Kettell, (1983) p. 57). Moreover, the Organization for Economic Cooperation and Development, OECD, has estimated that the rate of increase in consumer prices was about five percentage points higher in the twenty-four OECD countries in 1980 than it would have been in the absence of the oil price increases. See Bell and Kettell (1983), p. 53.

[3]The instability of the world economy no doubt has its effect on these oil-exporting developing economies. Aside from the openness, these economies have maintained a relatively free system of trade and payments, at least during the period covered by this research. In fact, their national currencies have been pegged to the U.S. dollar despite the floating of most world currencies since 1973.

[4]In fact, the partial equilibrium nature of the "elasticities approach" left monetary policy completely out of the picture and neglected the effect of devaluation on the level of income. But, the integration of income movements with the "elasticities approach" led to

the inclusion of the income elasticities in the analysis. See Harberger (1950).

[5]For more on the problem of the simultaneous equation bias. See J. Johnston (1972) and Koutsoyiannis (1977).

CHAPTER II

THE LIBYAN ECONOMY: ITS BALANCE OF PAYMENTS AND FINANCIAL SYSTEM

The Libyan Economy

Libya has a very important geopolitical location. The country is located in the heart of North Africa, with a large size that exceeds 1,760 thousand square kilometers. Despite its huge area, the country is sparsely populated. Population was estimated in 1983 to be about 3.5 million. Libya is surrounded by the Mediterranean Sea to the north, Egypt and the Sudan to the east, Tunisia and Algeria to the west and Chad and Niger to the south. This important location has exposed the country to foreign invasion throughout its long history. The last foreign invasion was the Italian colonialism during 1911-1939, which was followed by the British and French mandate after World War II.

In the pre-oil era, the country was considered among the poorest of the world. The economy suffered from extreme shortages of all kinds, such as lack of mineral resources, poor natural resources, lack of skills of all types, limited water resources, severe climate and limited arable lands. The result was numerous bottlenecks which hindered the country's chance of achieving real economic development. These hopeless conditions led the development economist B. Higgins (1968, p. 37) to state that "...there is no hope for the Libyan economy to develop, and

if it does, then there will be a chance for all the less developed countries to do so." Therefore, in that era the Libyan economy represented an example of a most hopeless and impoverished economy.

Libya entered the oil club in the late 1950's and by mid-1960's the country had become one of the major oil producers. Since the discovery of oil in 1959, the oil sector started to play a vital role in shaping the structure and characteristics of the economy of Libya. As a major oil exporter and an active member of OPEC, Libya began to play an essential role in the organization's policy formulations and decision-making. On the domestic front, the domination of oil has resulted in transforming the Libyan economy into a single-export economy. Foreign trade began to have a great impact on the overall performance of the economy, and made the whole economy more vulnerable and sensitive to external shocks. The oil discoveries and exploitations have their fingerprints on the economic development of all sectors of the economy. The foreign exchanges generated from oil exports have made the economy able to overcome its problem of capital funds shortages. Oil revenues indeed did break the financial constraints and furnished enormous supplies of capital funds. The surpluses generated from oil exports, especially after the 1973 oil price adjustment, led to considerable sectoral imbalances and created new problems which did not exist under the traditional economy. The economy's huge foreign exchange surpluses were more than what the economy could absorb. In spite of its sectoral imbalances and the limited absorptive capacity, the economy grew at an average real rate of growth of 4.7 percent during the period 1960-81. Now, Libya is classified among the highest per capita income countries in the world. The per capita income jumped from

50 U. S. dollars in 1952 to more than 8,450 dollars in 1982 [The World Bank Atlas, (1983), p. 16].

The rapid increase in the country's gross national product (GNP), in response to the expansion of the oil sector accompanying the oil price increases of the 1970's and early 1980's, made possible the enormous investment expenditures adopted by the three-year economic plan of 1973-75 and the two-five year plans of 1976-80 and 1981-85. These plans envisioned structural changes to remedy the economic imbalances through concentration on the diversification of the national economy.

All the economic plans have stressed the development of non-oil sectors, particularly the production sectors, agriculture and industries, in an effort to reduce the future dependence on the externally-oriented oil sector.(1) However, in spite of the efforts to reduce the dependence on oil and to correct sectoral imbalances, oil is still the dominant source of income. For example, the gross domestic product, GDP, of 1981 reached $27,460 million; its structures still emphasizing the dominance of the oil sector, where oil contributed 71 percent of that year's GDP, hence, leaving only 29 percent as the combined contribution originated by all non-oil sectors in the economy. The two major production sectors' contribution to that year's GDP did not exceed two percent for the agricultural sector and three percent for the manufacturing sector [The World Bank Annual Report, (1983)].

The massive increase in the country's oil revenues made such immense investment allocations possible, but the Libyan economy could not effectively absorb these huge capital funds. In fact, the mis-allocation of resources, bottlenecks, shortages, etc. are clear manifestations of the socio-economic restraints which exercised severe

limits on the Libyan economy's capacity to absorb the oil-generated huge capital funds. Among the social and economic constraints, the most limiting factors are: (i) labor shortages, even at the nonskilled level; (ii) the sectoral imbalances, between internal and external sectors, as well as between the oil sector and other traditional sectors of the economy, especially the main production sectors, agriculture and industry; (iii) severe natural resource problems, such as a lack of water resources and the limited area of arable land;(2) and (iv) inflation, despite the government's effort to control prices and suppress the domestic inflation. The increases in the price level in Libya have been associated with large increases in the domestic money supply. For example, the money supply was more than tripled between 1975-1980, when it jumped from LD 844.45 million in 1975 to reach LD 2,856.83 million by the end of 1980 [CBOL Economic Bulletin, Jan-Mar. (1982)].

Although the empirical study will cover the three oil-based economies of Libya, Kuwait and Saudi Arabia, this chapter is devoted entirely to study the Libyan economy as a yardstick or a pattern. Since the main characteristics, conditions and structures of these Arab Muslim oil-based economies are very similar, the analytical expositions in the case of Libya are to a large extent applicable to the other two cases.

The rest of this chapter will be devoted to presenting an analytical exposition of the role and influence of the economy's external sector and its financial system. The purpose is to focus on their effect and role in influencing the behavior and overall performance of this developing small open economy. The aim is to pave the road for understanding the application of the proposed monetary

model to the Libyan, Kuwaiti and Saudi experiences which are the cornerstone of this research work.

The Balance of Payments of the Libyan Economy and the Foreign Exchange

The structure of the BOP records is expressed in major components or accounts. These accounts are presented in a double-entry bookkeeping system[3] which shows the flow of real assets and financial obligations into and out of the country for the given time period. The BOP statement is divided into four separate accounts or sub-balances: (i) the merchandise balance; (ii) the balance on current account; (iii) the liquidity balance (balance on regular transfers) or capital account; and (iv) the overall balance or official settlements balance.[4] Drawing a line through each account leaves some credit and debt items "above the line" and the rest "below the line". Taking all entries above the line for each account, when credits exceed debts the account is in surplus, however, the account is in deficit, whenever credits fall short of debts.[5]

An individual country in the world economy resembles a household in the closed economy; it cannot indefinitely run deficits on its BOP without taking strong measures to correct these continuous deficits. The deficit country is required to correct its external imbalance for two major reasons. First, deficit means that in terms of "autonomously" determined transactions debits exceed credits. This indicates that the deficit country's import purchase and its long-term world commitments, private or public or both, have exceeded its capability of meeting its foreign obligations through its foreign exchange earnings from national

exports and foreign investment reserves inflow in the country.(6) This situation puts the country into a fundamental external disequilibrium which is made possible by the inflow of short-term foreign loans. This position must not be allowed to continue indefinitely. Second, regardless of the form of holding these foreign debts,(7) the inflows of these short-term loans constitutes a potential claim on the deficit country's monetary reserves which are mostly made up of convertible foreign assets and gold. When the BOP imbalances persist the foreign claims may lead to a "crisis of confidence" when the deficit country is declared unable to repay its foreign lenders. These imbalances in the BOP, particularly in the case of deficiency, must be corrected to restore equilibrium in the external sector in order for the country to restore the world trust and achieve internal economic stability.

From a monetary analysis point of view, there exists two basic characteristics which distinguish a less developed economy from that of a developing one. They are: (i) the prevailing conditions of the financial sector; and (ii) the importance of the external sector. The rest of this chapter aims to cover these major points. It will study the foreign sector and the financial system of small open economy of Libya. As a starting point, the analysis focuses on the openness of the economy and the prime role of foreign trade and payments in this oil-exporting economy. Then a brief exposition of the financial system and monetary policy will be the subject of what remains of the chapter.

The Libyan Balance of Payments

As an oil exporter, the Libyan economy is highly linked to the rest of the world. The oil sector has contributed more than 50 percent of

the gross domestic product, GDP, and more than 99 percent of the country's foreign exports during the entire period of study. The high dependence on oil is reflected in the large degree of openness of the economy relative to the rest of the world (ROW)[8]. Over the period of study, which is dominated by the oil sector, the ratio of total trade/GDP (the absolute sum of exports and imports divided by GDP) or the ratio of openness has been growing over time. This finding, in fact, is common to all oil-based countries, where their economies are characterized by a large degree of openness, especially, through foreign trade. When the degrees of openness of the three oil economies of Libya, Kuwait and Saudi Arabia are compared with the relatively closed economy of the United States, the ratios of openness are found to be significantly greater than that of the economy of the USA by nearly 5.8, 6.2 and 6.1 times for Libya, Kuwait and Saudia Arabia, respectively.[9] The other common characteristic of these open oil economies is the fact that their openness is largely shown through foreign trade more than through the international capital flows. In the following we present a structural analysis of the different items of the Libyan BOP with more emphasis being put on the balance of merchandise trade.

The reason for studying Libya's external sector and its BOP statement is an attempt to understand the economic conditions that prevail in this mono-economy and to point out some of its strengths and weaknesses. We know that a permanent unfavorable BOP position in any economy is an indicator of existence of certain economic problems that economy is facing. The Libyan economy, during its pre-oil era, especially before 1964, suffered chronic external imbalances. The foreign trade sector widely reflected the harsh economic and business

conditions that dominated Libya's major economic activities. The leading exports of agricultural-based commodities (Esparto grass, olive oil, peanuts, hides, and live animals) were the most important exports. On the import side, all types of food and industrial products were Libya's major imports. In fact, the poor economic conditions and limited natural resources combined with a very low degree of economic development resulted in a severe and permanent unfavorable BOP situation. Foreign exchange earnings, as a result, were extremely limited and fell short of covering the country's foreign obligations. The BOP deficits were covered by loans, aid and grants from foreign sources.

In 1959, oil was discovered and by 1961 the country joined the group of oil exporters. Since the early 1960's the exploitation and exportation of oil in commercial quantities has introduced a new and vital element in the country's economic scene. The BOP statement began to show a favorable position on the current account balance. In fact, since the fiscal year of 1963/64, the external balance has recorded surpluses with the exception of a few years (1973 and 1975). The oil sector is solely responsible for the improvement of the country's external balance. However, foreign trade is concentrated on the export side, with crude oil exports consisting of more than 99 percent of the country's total exports [CBOL Balance of Payments (1975-1980)]. In Libya as is the case in other OPEC countries, the public authority is the sole recipient of the oil revenues. And through domestic public spending, the government injects the oil proceeds into the mainstream of the non-oil sectors. Because the domestic production base is limited, the aggregate domestic supply falls short of meeting the economy's ever-

increasing effective aggregate demand. As a result, large sums of private and public funds leaked out of the main income stream and found their way into the world markets as payments for the increased import demand for foreign products. In fact, the structure of the Libyan BOP reflects a typical example of an oil surplus economy, a case which will be made clear through the structural exposition of the Libyan BOP: (See Table I).

(1) The external payment position is determined to a large extent by the balance on current account, or the foreign trade side. The structural analysis of the merchandise exports shows that almost 100 percent were fuel-based products; metals and minerals. This composition had dominated the Libyan exports and maintained unchanged since the first shipment of oil exports began. The traditional exports are agricultural and animal-based exports. Their relative share has been declining over time, because of the increasing home demand for those products on one side, and their limited competitiveness in world market on the other side. The dominant and leading export is oil which constitutes nearly 99 percent of Libya's total exports with the exception of 1975 in which the share of oil exports declined to 94.1 percent due to reduction in world oil demand caused by the 1975 world recession [Secretary of Planning 1972-75 Report (1976)].

Although the Libyan imports reflect the dynamic process of developmental projects in the economy, the composition still, to a large extent, reflects the domestic limited resource base and the stage of development of this oil surplus economy. The structural analysis of the imports shows that foodstuffs, machinery and transport equipment continue to be the major items following the oil boom, [World Bank

TABLE I

THE LIBYAN BOP: 1970-1979
IN L.D. MILLIONS

Items	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
A. Oil Sector	583.2	733.9	666.0	755.5	1840.2	1433.2	2152.9	2786.4	2752.0	4414.7
Exports & re-exports (F.O.B.)	853.2	960.8	946.2	1194.3	2445.0	2003.6	2828.7	3373.8	2914.8	4728.5
Imports (C.I.F.)	-31.9	-19.4	-18.3	-14.5	-15.5	-27.5	-30.0	-45.0	-37.5	-65.8
Investment Income	-196.7	-197.6	-227.8	-265.6	-438.2	-350.4	-435.7	-358.5	-318.6	-948.0
B. Non-Oil Sector	-306.6	-406.1	-517.8	-780.2	-1307.8	-1835.4	-1769.4	-2314.6	-2408.9	-3080.3
(1) Goods and Services	-260.8	-371.1	-552.4	-788.4	-1327.4	-1595.0	-1474.6	-1948.8	-2193.4	-3077.7
(i) Exports and Re-Exports	3.0	1.7	3.9	5.3	-2.2	2.6	-3.0	3.4	2.9	2.6
(ii) Imports (C.I.F.)	-235.1	-346.4	-453.4	-652.6	-1215.9	-1427.3	-1215.2	-1571.0	-1812.1	(N/A)
(2) Unrequited Transfer (net)	-42.7	-35.1	-39.9	-49.9	-21.8	-50.3	-52.1	-66.6	-9.9	-277.0
(3) Capital non-monetary sector (net)	-3.1	+0.1	-74.5	58.1	-41.4	-190.1	-242.7	-299.2	-116.5	-40.9
Private (net)	-3.2	3.9	89.5	113.7	113.4	-176.9	3.85	15.4	-30.6	(N/A)
Public (net)	0.1	-3.8	-15.0	-55.6	-72.0	-267.0	-281.2	-314.6	-85.9	(N/A)
C. Net errors and omissions	-36.3	-19.1	-7.8	-305.0	26.8	-77.0	-46.5	-18.4	-5.4	-42.1
D. Total A + B + C (**)	+240.3	+308.7	+140.4	-329.7	+505.6	-479.2	336.0	453.2	-147.3	686.9
E. Monetary Movements	-240.3	-308.7	-140.4	+329.7	-505.6	+479.2	-336.0	-453.2	-147.3	-686.9
(increase in net assets)										

Source: Central Bank of Libya "Economic Bulletin," Vol. XXII Nos. 7-12 (July-Dec. 1982). Table 30.
(*) Provision (+) inflow, (-) outflow.
(**) The country started to participate in DSRs only in 1978.
(N/A) Not available.

Report (1983)]. The analysis of food imports indicates that cereals and their by-products constitute the largest portion in total import demand for food. This may be attributed to the harsh climate and severe droughts, which hit the country in some years, combined with the use of large quantities of cereals as an animal feed [CBOL Econ. Bulletin Jan.-Mar., (1982)]. The economic development efforts and the implementation of the socio-economic plans are the major contributors to the large increases in the total volume of imports, which have been increasing to meet the increased demand for machinery, tools and transport equipment required by the plans. For example, the building of social overhead capital, or infrastructure of the economy such as the new port facilities, storage facilities, roads, which has been a major economic goal during our period of study, led to an increase in the demand for machinery and equipment. The expansion of the agricultural projects and the establishment of the industrial bases in the economy as intended by the 1976-80 transformation plan, as well as the above factors, all resulted in increasing the import demand for capital goods. All the mentioned factors have led to an increase in the marginal propensity to import and diversified the composition of the Libyan imports.

(2) The impact of oil on the Libyan external balance is quite immense, a fact which is shown by the overall payments which indicates an outcome of net surplus in the BOP over the entire period of study with the exception of the years 1973 and 1975; (see Table I). However, the 1973 deficit is due primarily to the big record on the net errors and omissions item, which seems to be responsible for nearly 90 percent of the total deficit of 329.7 million Libyan dinars (L.D.). It also coincides with the interruption of oil exports and the oil embargo to

the USA and Holland as a result of the 1973 Arab-Israeli War. The deficits of 479.2 millions L.D. on the 1975 overall balance may be attributed to the large decline in the world demand for oil which resulted from the 1975 world-wide recession that followed the 1974 oil price increase. During the rest of period of study (1970-79), Libya's external balance enjoyed a net BOP surplus. However, the current account surpluses of the oil sector are contrasted with a net deficit in the non-oil traditional sectors of the economy as illustrated in Figure 1. This situation leads one to conclude that Libya's external balance, exclusive of oil, continues to suffer from the chronic deficit problem which prevailed and characterized the pre-oil era.

Also, the oil sector has played a dominant role in shaping the structure of the BOP in Libya on the asset side as well. This situation is made clear by the dominance of public assets of the capital movements of the non-monetary sector [see item 3 in Table I]. In brief, the oil sector's dominant role is expected to continue in the near future, until the economy builds up its infrastructure and its productive base is highly developed. When the economy takes off, the dual situation will start to be removed and the economy's dependence on oil exports will be reduced.

(3) In Libya the public authorities (government) are the sole owner of oil and mineral resources in the economy. Therefore, the oil sector's net surplus of foreign exchange accrues totally to the public sector. Less than one percent of total assets in this balance is provided by the non-oil traditional activities.(10) However, the non-oil sector is expected to play a vital role in the export receipts side, when the agricultural development projects are completed. The aim is to

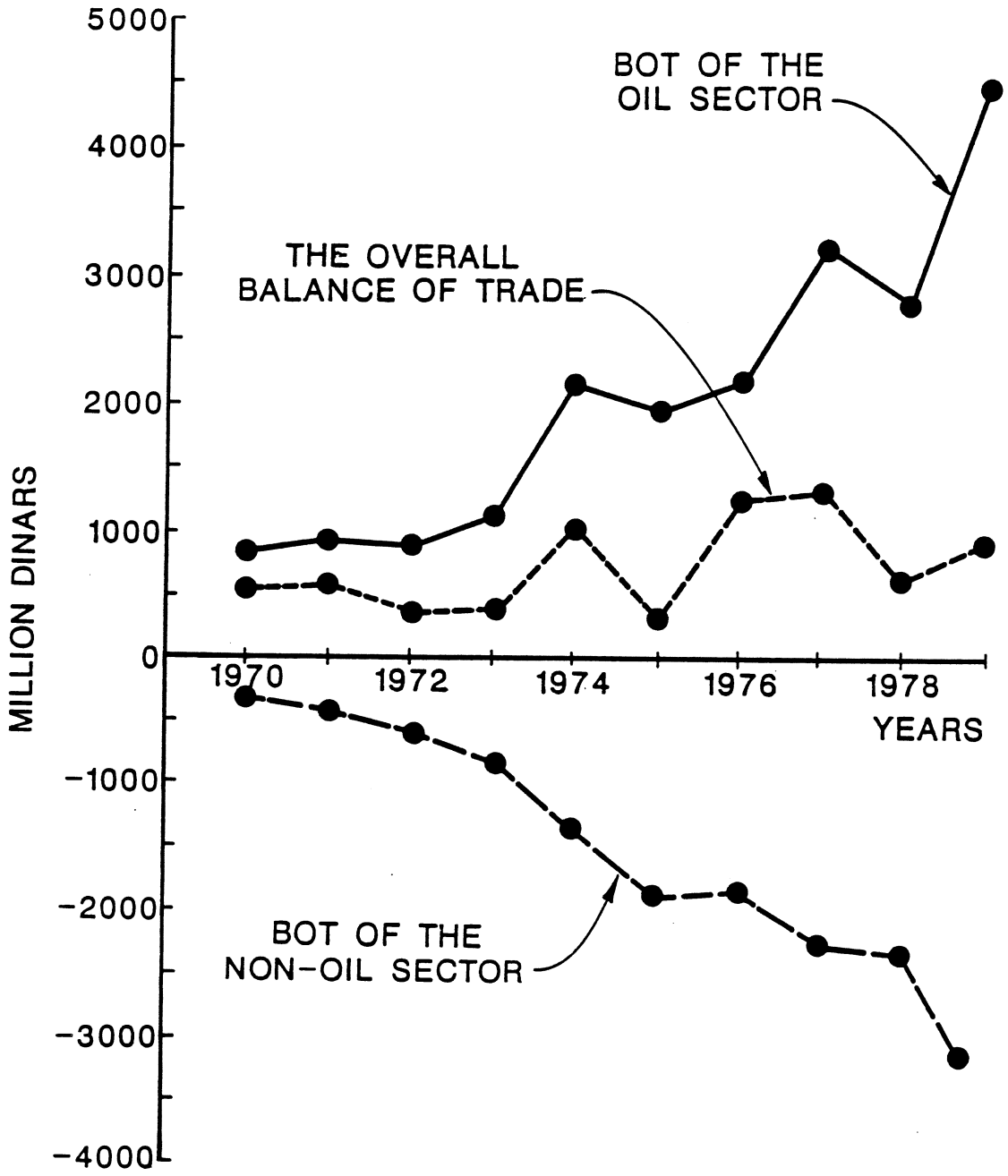

Figure 1. The Libyan Balance of Trade: 1970-1979

diversify the production base and break the dependence on oil through the agricultural and industrial development. In fact, the future role of agricultural exports in Libya is promising, since the country is very close to the major world market of Europe. Taking into consideration the advantages of the closeness to that large market, Libya could be a major exporting source of many early agricultural products. In brief, the development of a modern agricultural sector will work to achieve two simultaneous goals. The production increase will lead to a reduction of foodstuffs imports and to an increase of exports from the early yields.

(4) The "Errors and Omissions" item in the Libyan BOP statement fluctuates from year to year as shown by Table I. It represents some of the unidentified capital outflows and also reflects some unspecified payments which are not included in other items and need to be recorded, for example, the smuggling of commodities to neighboring countries as Egypt, Chad and Tunisia. Besides, the item reflects the smuggling of invisibles, since some individuals, including nationals and foreigners, do purchase foreign exchanges in the black market and smuggle them outside the borders. Therefore, the item serves to capture those trade and payments items which do not show in the normal recording procedure.

(5) The last item in Table I, which is designated by the letter E, shows the monetary movements. This item reflects the change in net foreign assets holdings of the banking system in Libya.[11] It recorded a net increase in foreign reserves over the whole period of study exclusive of the deficit years of 1973, 1975 and 1979. These BOP deficits were financed by a reduction in the international reserve holdings of CBOL.

Foreign Exchange in Libya

Libya has used a fixed exchange rate system since 1953, when the first monetary authority was established. But the value of the Libyan national currency had undergone various changes.(14) Changes in the foreign price of the domestic currency (devaluation or appreciation) produce its effect on the external sector of the economy through its effect on export supply and import demand. However, in the case of Libya, as mentioned above, oil constitutes almost the entire volume of exports. But its price is immune to changes in domestic currency, since oil is paid for in U.S. dollars. This means that the appreciation of the dollar produces no effect on the export side. On the import side, the appreciation (devaluation) of the dollar reflects a devaluation (appreciation) of its intervention currency, such appreciation (devaluation) is expected to raise (reduce) the imported inflation. In Libya, given that the national currencies of the country's major trading partners rose as a result of the devaluation of the U.S. dollar, an offset in the Libyan price may occur as a result [Baryun (1980)].

This research draws on the monetary approach to the BOP views, which identifies the BOP of a country as the rate of change of the foreign reserve holdings of its banking system. Therefore, the country's BOP is linked directly to its monetary base and money supply. Since the Libyan BOP statement recorded surpluses with the exception of few deficit years, a direct link between the Libyan external balance (BOP) and the monetary sector is a major proposition in this analysis. This link necessitates the study of the Libyan financial and monetary system. The rest of this chapter will be devoted to study the structure of the Libyan financial system and its financial

institutions in order to understand the performance of the money market.

The Financial System in Libya

The financial sectors in the LDCs are characterized by the low degree of development of both their capital and money markets. Libya's financial sector is no exception. The capital market in Libya is completely absent, a fact which is reflected in the weak link between the monetary and real sectors. The money market is narrow with its activities limited to the large urban centers. As in the case of most LDCs, the variety (spectrum) of financial assets available to wealth holders is extremely limited; mostly to the choice between money and real estate. In Libya the market for government securities started in 1973, however their trade is limited to the banking sector. Their major holder is the CBOL with a small quantity sold to the commercial banks. The dealers and brokers who bear the risk of fluctuations in the capital value of the securities do not exist. Moreover, the private securities and commercial papers which do exist are of limited scale and quantity.

The financial sector plays an essential role in bringing both savers (lenders) and investors (borrowers) together and the degree of separation between these agents reflects the level of development of the financial sectors. The Libyan financial system is rudimentary and is not capable of performing efficiently the important role of mobilizing savings and allocating them to investment. The narrowness and low development of the capital and money markets result in a lower degree of monetization, therefore limiting the financial and money deepening in the national economy. These facts enable one to conclude that the financial system in Libya tends to be fairly simple in its structure and

in terms of instruments as well as types of institutions. The structure of the system is summarized in Figure 2. The system comprises of the following financial institutions: (i) the monetary authorities or the CBOL and the Libyan Treasury; (ii) the banking system excluding the CBOL; and (iii) the non-banking saving institutions which are comprised of the country's two insurance companies and the national investment corporation. After this introduction, the rest of the chapter will analyze briefly the modern development of the above mentioned financial institutions and their roles in the economic development in the Libyan economy.

The Central Bank of Libya (CBOL)

The Central Bank of Libya (CBOL), which will be referred to as the Bank, is the body responsible for carrying out the monetary policy decisions of the country. The financial structure reflects the constraints and opportunities facing the central banking institution. The first stage toward the establishment of the Bank was in 1956, when the "National Bank of Libya" started its operation as the new monetary authority in the country. It was established to carry out the functions of: (i) managing the issue of paper money and coins; (ii) keeping the reserves needed for maintaining internal and external balances; (iii) acting as a banker for the Federal government and the local administrations; and (iv) conducting credit policies with the aim of serving the economy's credit needs [CBOL Annual Report (1967)]. The National Bank of Libya was established with the intention of performing the functions of a central banking entity, of achieving the credibility of a responsible and effective body that is capable of installing

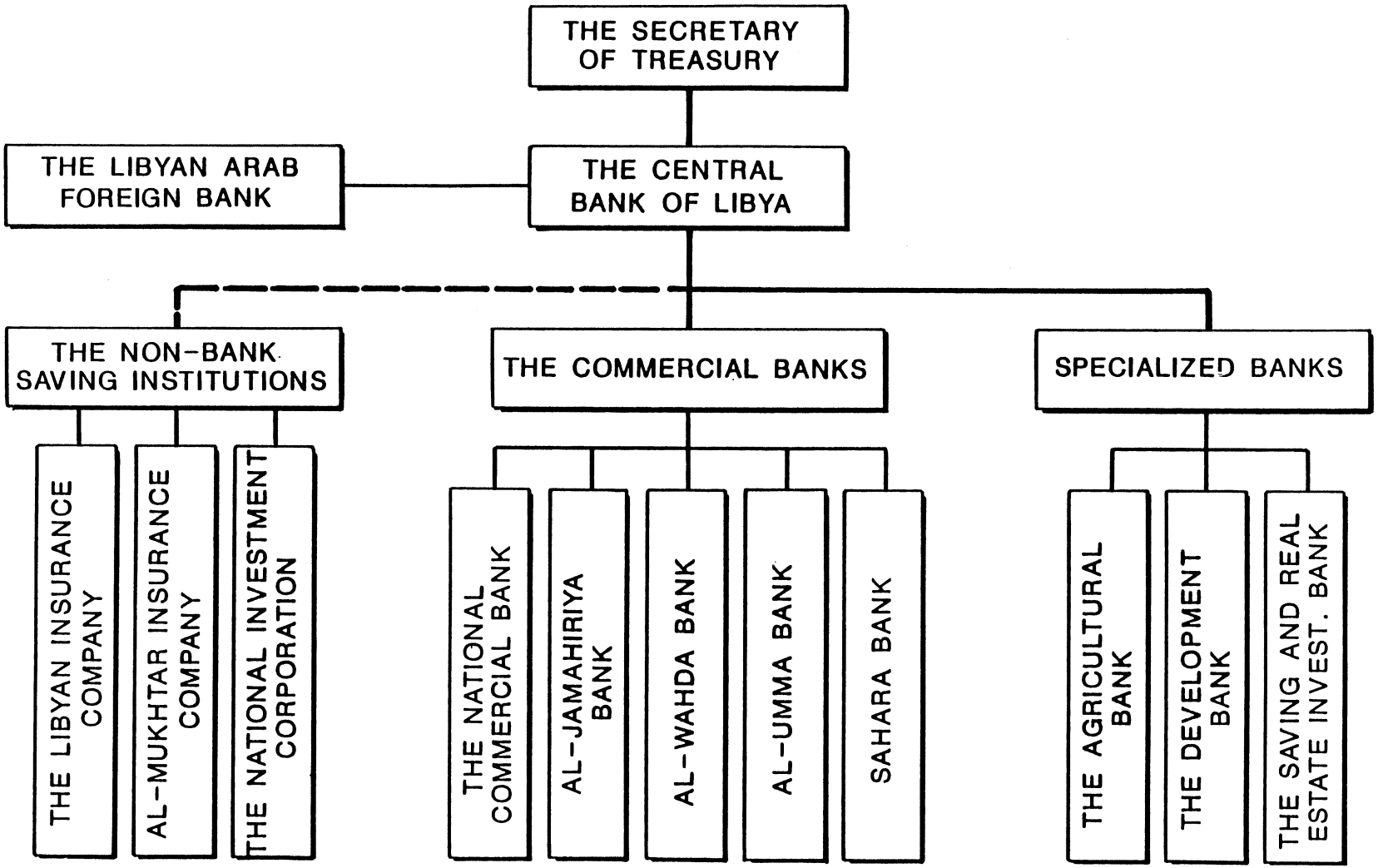

Figure 2. The Structure of the Libyan Financial System

domestic and foreign confidence in the domestic currency and financial system. However, the law which established the Libyan National Bank made a radical departure from the conventional pattern of central banking status by allowing the national bank to undertake ordinary commercial activities. The second stage in the development of the Bank came with the Banking Law of 1963 which renamed it as the "Bank of Libya" and empowered it with more tools to conduct its functions. However, the final step for the Bank to undertake all its functions as a full-pledged central bank came in 1970 when the Bank was called "The Central Bank of Libya." The CBOL became fully responsible for conducting the traditional central banking functions. The law empowered the bank to serve as: (i) the banker of banks; (ii) the fiscal agent for the government; and (iii) the responsible body for the implementation of the country's monetary policy.

The 1970 amendment of the Banking Law separated the Commercial Operations Department from the Bank to enable the central entity to devote all its efforts to the central banking activities. In order to undertake the responsibilities of a monetary authority, the Bank is reorganized into major departments: one is the Central Banking Department, through which the Bank performs its functions as a banker to banks, a controller and regulator to credit facilities in the economy, a banker to the government and a manager of the country's investment abroad.(13) The Bank has performed its function as the banker to the government by acting as buyer and seller of government securities since 1973. The function of conducting monetary policy will be covered later in this chapter. The second department is the Issue Department through which the Bank manages and controls the currency issuance in the

country.

The CBOL, like many central banks in the LDCs, attempts to encourage and assist the economic development process in the country. In fact, the institution has undertaken its traditional functions such as managing the currency issue, supervising the commercial banks, managing the nation's foreign exchange results, including the operation of exchange controls and serving as the government's agent. Moreover, it encourages the extension of the commercial banking services in the rural areas and influences the allocation of long-term investment credit. The Bank, in fact, has carried out these assignments with considerable skill and succeeded in assisting in the accomplishment of the economic Plans' goals.

The Commercial Banks

Commercial banks are the major and important financial institutions that operate in the Libyan economy. Over the last 30 years, commercial banking in Libya has changed substantially due to increasing Libyanization (Libyan-owned) and higher government control over the banking operations. Prior to 1960, there were eight commercial banks operating in the Libyan economy, all of them subsidiaries of foreign banks and entirely under foreign ownership and control [Baryun (1966)]. The commercial banking market, excluding the small operations of commercial banking transactions carried by the Libyan National Bank, was completely a market for foreign banks. In efforts to correct this situation, the Banking Law of 1963 ordered the Libyanization of 51 percent of these foreign branches. The Libyanization process was slow. However, by 1970 all the foreign banks' shares were nationalized. Since 1970 the number

of commercial banks was reduced to five major banks[14] and the entry door was closed, see Figure 2. The expansion of banking services, therefore, is limited to opening new branches by the existing banks. The growth of the economy and the expansion of banking habits have reflected an increasing demand for the banking services. By 1981, the banking services were supplied all over the country by 142 branches spread in various cities, towns and villages [CBOL Annual Report, (1982)]. The reorganization of the banking structure aimed at: (i) widening the geographical coverages and spreading banking services into rural areas; (ii) increasing mobilization of deposits; and (iii) reallocating bank credits in favor of sectors and activities previously neglected. The achievement of these goals requires increasing the public ownership and control over these financial institutions. This change took place in the decade of the seventies.

The commercial banks as profit-seeking firms concentrate their activities in the low-risk and high-return short term credit facilities. Under their old structure as private firms, the banks extend most of their credit services to the trade and service sectors. The limits to their operations were the domestic economy's absorptive capacity and the public's desire to hold currency rather than bank deposits. The commercial banks in Libya are required by law to hold at least 15 percent of their portfolio in a form of liquid assets as indicated by Article 36 of the Banking Law No. 4 of 1963. The full takeover of the banks by the public sector guaranteed their cooperation toward the fulfillment of the economic policies as presented by the economic plans. The public control of commercial banks intends to achieve wide spread use of bank credit, direct a large flow of credit to

priority sectors, and make banks more effective instruments of economic progress. The analysis of the banks' credits by purpose indicates that commercial banks credits to the productive sectors, particularly in agriculture and industries, recorded a large increase since 1975, accompanied by "relative" decline in the share of the traditional customers of these banks as the trade, commerce and service sectors. In fact, the data on credits offered to the traditional sectors recorded an extreme decline since 1978 due to the liquidation of private enterprises, which started to be replaced by publically owned companies and corporations.(15) In short, the significant changes in commercial banking aim to increase the role of banks as catalytic agents of development in order to influence the allocation of credits given by commercial banks among various uses, in accordance with any investment strategy and public policies.

The Non-Commercial Specialized Banks

The specialized banks were established with the purpose of extending credit needs for commercial activities. These banks were seen as feasible alternative financial institutions filling the gaps created by the commercial banks' profit motives. These specialized institutions are state owned banks set up to cater loans to those economic agents which meet the conditions as stated by the law. These banks do not accept deposits from the public. The specialized banks which operate in the Libyan economy are as follows.

1. The Agricultural Bank: The bank was set up in 1955 with the aim of stimulating agriculture and animal production through extending low cost loans, aids and encouragements in such productive fields. The

bank carries out the government's policy via loans and various facilities to farmers as well as its direct participation in some projects and companies which work in the bank's area of interest. The bank offers three types of loans:(16) (i) Short-term loans to enable farmers to purchase seeds and fertilizers; (ii) Medium-term loans to buy machines and equipments; and (iii) Long-term loans to finance land reclamation and drilling wells.

2. The Industrial and Real Estate Bank: The bank was set up in 1966 with the purpose of offering long-term loans to build housing for low-income groups and to support existing and establish new industries. In 1981, the bank was replaced by two specialized banks: [CBOL Annual Report (1984)] (a) The Saving and Real Estate Investment Bank: This new bank was set up in January 1981 with the purpose to extend credits to housing and construction projects. This bank conducts credit policies in accordance with the framework of the goals of the social and economic plans. (b) The Development Bank: This bank was set up by the Law No. 18 of 1981 for the purpose of extending credit facilities to finance agricultural, industrial and tourism investment projects.

3. The Libyan Arab Bank: The bank is wholly owned by the CBOL. It was established for the purpose of managing and supervising the government's foreign investments. The bank's scope of activities is outside Libya, with its operations limited, in various cases, to participation in the ownership of some banks and companies abroad. The bank also finances some investment projects in some friendly countries [Baryun (1981)].

The Non-Bank Saving Institutions

This group of financial institutions includes the "Libyan" and "Al-Mukhtar" Insurance companies and the National Investment Corporation (NIC).[17] These two insurance companies are publically-owned. Besides, they are the only insurance providers to the whole economy. The NIC was established in 1970 with the purpose to help pool the available financial resources in the economy. The scope of its activities are concentrated in the area of housing and tourism [El-Sharif (1980)].

In short, financial intermediation in Libya is conducted by the above mentioned institutions. The CBOL is the apex institution of the financial system while the commercial banks play the predominant role. The specialized banks were founded for the purpose of extending credit for specific economic activities. Meanwhile, the non-bank saving institutions' activities have been limited mostly to real estate. The last two agents have a very limited monetary impact which can be ignored. However, the structure and evolution of the Libyan financial system since the early 1970's have been subject to an increasing degree of public ownership and control. Practically, all financial institutions are now under public control and almost all financial assets flow through the public sector. The extensive control of the financial system is aimed at ensuring the flow of financial assets into desired directions, in particular, to priority areas of development such as agriculture, industries and rural areas in accordance to the Plans' goals. The dominant impact on the system is to be limited to the CBOL and the commercial banks operating in the economy. In conclusion, the financial system of Libya is dominated solely by the banking sector.

The Libyan Financial Policy

The official financial policy is expected to support the goal of the resource allocation mix adopted by the economic plans which aims to achieve growth and price stability in the domestic economy. The financial policy, therefore, is directed toward providing adequate liquidity in the economy to meet the transaction purposes and to help pool domestic savings. The official government policy is to control credit in the economy with the objectives: (i) to ensure a planned credit expansion for the economy as a whole; and (ii) to make sure that credits flow to desired regions and sectors in order to meet increasing production, to fulfill output targets and to achieve other national social and economic objectives. In addition, the mobilization of the available domestic resources and their reallocation aim to support achievement of the plans' economic goals. The financial policy is, in fact, affected by two major factors which exert their strong effect on the conduct of the financial and monetary policies.

First, as in the case of many LDCs, Libya suffers from the problem of financial dualism as presented by the existence of two money markets that operate in the economy.(18) However, the case in Libya is less severe since the role of the unorganized money market is limited and declining. The oil boom help spread the monetization of the economy, while Islamic teachings help remove all interest charges since Islamic laws condemn all types of interest rate payments. In Libya, the absence of a developed capital market prevents the exercise of a sound financial policy and affects the policy's role in mobilizing, directing and channeling domestic savings. However, the money market in Libya is relatively more developed as compared to the capital market, which makes

financial assets other than money extremely limited. Hence, the available spectrum of real assets is dominated by the low-risk, high-yield real estate. The available choices of financial assets are very narrow and limited to some commercial papers, some stocks and shares of a few joint companies and a limited quantity of government securities along with money as the dominant financial asset. Therefore, if money is excluded, the market for financial assets is extremely narrow and concentrated in few hands, mostly the banking system and a very small number of high income individuals. In fact, the limiting factor on the role of financial policy is not only the narrow range of available securities, but also the size of their market as well, which explains why the financial assets are mainly in the form of money that is currency and bank deposits.

Second, the low state of development of the non-bank saving institutions and the wide spread hoarding on the part of the public have resulted in malallocation of resources and insufficient mobilization of savings. As a result, banks have become the major provider of liquidity needs in the economy. These facts are reflected in the form of savings which exist in the economy. In any society, savings are dominated by the type of financial assets available to savers (i.e. in Libya most savings are in the form of cash and bank deposits, which are essentially liabilities to the banking system). Thus, given the structure of the Libyan economy, the banking sector is responsible for furnishing sufficient liquidity in the economy to finance transactions and to facilitate exchanges, as well as pooling domestic savings. The Libyan economy, in general, enjoys a high liquidity because of the limited size of its money market and the slow spread of banking habits among the

Libyan society, especially in the early 1970's. The fact that financial securities are mainly limited to money indicates that financial policy is impotent and makes the monetary authorities play an essential role in the management of the monetary sector in the economy.

The Libyan Monetary Policy

The exact quantitative role that monetary policy plays in determining money and credit in any economy is not a matter of general agreement among economists. Thus, every government tries to execute the proper money and credit management that it sees as suitable for achieving the ultimate goals of economic stability, growth, and internal and external balances. However, when the financial system is imperfect and still in its early stage of development, the quantity of money and the availability of credit are the only targets which can be managed [El Hassia, (1979)]. Moreover, the specific tools of money and credit management in practical use differ among the monetary authorities (central banks) due to reasons related to the institutional circumstances in each country. The monetary authorities in Libya have to decide on the optimal quantity of money and credit, taking into account the objectives of its economic policy. The CBOL's ability to control the quantity of money (i.e. reserve money) in Libya is directly related to the Bank's experience and capability in controlling its balance sheet. The structure of the Bank's balance sheet reflects the fact that foreign assets (i.e. the BOP) and government deposits (i.e. the government budget) are two dominant factors in that statement, and both elements are exogenously determined. Foreign assets is a function of the price and quantity of oil and both are exogenous to the Bank.[19]

And government deposits, which are determined by the budgetary actions, are exogenous to the Bank as well. Therefore, the oil revenues materialize as increases in private liquidity (money supply) only when the government conducts domestic spending, hence using its deposits at the CBOL. Accordingly, fiscal policy actions do, in fact, exert a strong and effective control over the rate of domestic money growth.(20) Hence fiscal and monetary policies in Libya are not quite separable since they are not independent.

The Banking Law of 1963 and its amendments have empowered the Bank with all the tools of monetary policy which are available to central banks. The Bank, however, uses the policy tools in various degrees with the exception of the tool of open market operations. Open market operations is not a viable tool due to the rudimentary nature of the Libyan financial structure. Given the institutional set-up CBOL has at its disposal the rest of the traditional monetary control tools are:

(1) The bank rate: although the Law empowered the Bank to change the discount rate (the bank rate), the rate has remained unchanged at 5 percent since February 1961.(21) In practice, the discount of bills and other papers has not been of significance in influencing the commercial banks' ability to extend credits, due to the excess liquidity they enjoyed particularly in the 1960s and early seventies. Since, commercial banks rely less on borrowing from the BOL, the discount rate is rendered an ineffective tool of monetary controls.

(2) The required reserves ratio: the Law requires commercial banks to keep a portion of their deposits with the CBOL. Changing the reserve requirement is considered an important tool in managing the monetary sectors in the LCDs [Goode and Thorn (1959)]. In Libya the

reserve requirement ratios were set at 15 percent on demand deposits and 5 percent on time and savings deposits since the early sixties.(22) However, despite the importance of variation in reserve requirement ratios, the CBOL never practiced its right to influence the lender power of banks, with the exception of 1966 when the ratio on time and savings deposits was raised to 7.5 percent.

(3) Credit controls: the CBOL is empowered to undertake direct quantitative and qualitative credit controls to promote monetary stability and economic growth. The CBOL requires commercial banks to hold a liquidity ratio of liquid assets to deposit liabilities. The actual liquid assets and the required liquidity ratio are affected by the deposit liabilities as well as by the commercial banks' utilization of these liabilities and both terms have gone various changes till 1970.(23) However, in order to expand credit facilities to the private sector to stimulate the economic activities and to insure a more effective participation in the country's economic development, the required liquidity ratio was reduced to 15 percent on November 1970, which is still in effect since [CBOL (1982)]. This policy aims to help banks enjoy more liquidity, therefore, to be able to extend more credit to the private sector.

(4) Direct credit control is among the control tools available to the CBOL. So the Bank relies heavily on credit regulations. This practice of direct credit controls aims to control the potential capacity of the commercial banks' ability to extend credits. Therefore, the focus of the Bank is on reducing commercial banks' credit to nonproductive activities, (i.e. trade and services) and encouraging credit flows to the productive ones. The Bank practices selective credit controls as a

device to direct bank's resources towards specific economic activities in the sectors of agriculture, industries and real estate.(24) As the case in many LCDs, the CBOL depends on the use of moral suasion as an effective tool of money management. The banking system reorganization, brought about by the 1971 amendment of the Banking Law No. 3 of 1963, made the Bank able to carry out effectively its decisions, since it owns the largest three out of five commercial banks.

Given the structure of the financial institutions and the character of the money market in this oil-based LDC, the monetary management conducted by the monetary authorities is of limited role: (i) The Central Bank of Libya's prime credit policy is to manipulate the banks' credit rather than its cost. Influencing the size of credit instead of the cost is of prime importance. Such policy is reflected in the Bank's decision to fix the rate of interest charged by commercial banks. Accordingly, a ceiling was imposed on the maximum interest charged by commercial banks of 7 percent for secured loans and 7.5 percent for nonsecured ones. Moreover, demand deposits are interest free, and the interest rate on time and savings deposits was fixed at 4 percent. These ceilings imposed on the interest rates meant to limit the commercial banks ability to raise the interest charges to their customers. Since all rates are linked to the bank rate (discount rate), any increase in the rate will increase the Bank's rate by the new interest rise, but as demonstrated above, the discount rate was kept constant. The policy of having an interest ceiling resulted in preventing the use of the discount rate as an effective tool of monetary controls. Moreover, such policy may help the development of an active securities market.(25) In general, due to the imperfection of the money

market in addition to the rudimentary nature of the capital market, the quoted rates of interest fall short of reflecting the market conditions. Therefore, the existing rates of interest neither reflect the resource allocation function nor the true market forces. (ii) The Bank, therefore, considers the selective credit controls and moral sausion as the major important instruments of monetary controls. Therefore, the Bank utilizes such tools with the aim to provide a degree of flexible monetary policy and to help regulate credit flows to the various sectors of the economy in accordance with the goals of the development plans. (iii) Given the relative free trade and fixed exchange rate, the Libyan economy is linked closely to the outside world. This inter-dependence with the world economy causes the domestic economy to be sensitive to the world economic conditions. (iv) Given the nonexistence of open market operations as an effective tool of monetary controls, it makes the monetary authorities unable to influence the stock of available funds.(26)

Generally, in a world of a fractional reserve banking system, the stock of money in the economy is a product of base money (reserve money, high-powered money, or monetary base) and the money multiplier. Therefore, the efforts to control the aggregate money stock or to make changes in the money supply will depend on the monetary authorities' capability to control the monetary base and/or the factors which effect the behavior of the money multiplier.(27) The control of the money multiplier is not solely under the influence of the monetary authorities. Thus, sound monetary controls will rely on the effectiveness of the authorities' control over base money. The control of base money requires the control over its domestic and foreign components.

Indeed, it is crucial for the maintenance of monetary stability to acquire a ceiling on the growth of base's components in order for the authorities to be able to control the aggregate money supply in the economy.

In brief, the CBOL is the sole holder of foreign assets since the law requires the government to keep its foreign exchange earnings (oil revenue) in its account at the Bank. Since the foreign assets item is completely exogenous to the Bank and is determined by the volume and prices of oil exports, changes in government accounts actually are the dominant effect on the monetary base. By law the CBOL is the agent responsible for the management of the country's monetary policy. It operates through regulating the amounts of credits and via influencing the overall level of loans and deposits of the banking sector. The domestic component of base money is the domestic credits creation of the CBOL. Its major items are net claims on banks, net claims on government and net claims on public corporations and institutions. However, claims on government is the essential item of the net domestic assets of the CBOL.

Finally, as indicated above, most of the tools of monetary control used by the CBOL are ineffective with the exception of the selective controls and moral suasion. Adding to this the strong fiscal influence on monetary controls, the Libyan economy furnishes a clear example where fiscal and monetary policies are not quite separable, but form part of a single unified policy. In fact, such special institutional characteristics are not unique with Libya, but rather are shared by a large group of oil exporting less developed countries including Kuwait and Saudi Arabia.

ENDNOTES

[1]The 1981-85 transformation plan stresses the goal of building a sound economy to be achieved through: (i) concentrating the efforts on increasing domestic production, by putting more emphasis on agriculture and industry with the hope of achieving annual growth rates of 8.8 percent and 19.9 percent for these activities respectively; (ii) reducing the dependence on oil exports as the major source of income; and (iii) raising the yield and efficiency of all available resources whether human, material, or natural, through the acceleration of the development of all non-oil sectors in efforts to reduce the costs of production. See the Secretary of Planning, Draft of the 1981-85 Plan, (1980). The 1980-85 economic plan called for a total investment allocation of Libyan Dinar (LD) 18.5 billion (about $60 billion) over the five-year plan period. The investment allocation to agriculture development accounts for 16.7 percent (about $10.00 billion) of the plan's total investment allocations. See CBOL Annual for report (1981), p. 55.

[2]In spite of the large area of the country, less than five percent of the country's total area is considered arable lands, and the remaining 95 percent is a harsh desert dry climate.

[3]The double-entry accounting system requires that total debits must equal total credits with the net balance (difference) equal to zero.

[4]The overall balance or the official settlements balance is the balance which focuses on the country's effort to defend its own currency and shows its capability in meeting the country's obligations toward the rest of the world (ROW). See Lindert and Kindleberger (1982) p. 276.

[5]To make the concept of "above and below the line" more clear, consider the following example: dealing with the current account, all above the line entries show credit and debt items which represent flows

of goods and services including gifts, or flows of resources which are currently used. Meanwhile, the below the line entries show all asset flows between the country in consideration and its trade partners. Thus, a surplus on the current account reflects a net foreign investment while a deficit on the account indicates disinvesting abroad because the country is importing more goods and services, hence, becoming a net debtor to its trade partners. See Mason (1975), pp. 72-73.

[6]When the basic balance includes only trade flows (i.e. excluding the autonomous capital flows) deficit would mean the deficit country is absorbing more real resources than what its national economy produces. See Mason, (1975), p. 66.

[7]The short-term inflows can take various forms. They could take the form of an increase in private foreign-held bank deposits in the deficit country or short-term government obligations purchased by a foreign central bank.

[8]For more details on the measures of the openness of the economy to the ROW. See Marina N. Whitman (1969) pp. 729-753.

[9]Using the ratio of total trade/GDP (the absolute sum of exports and imports divided by the gross domestic product) as an indicator for the degree of the economy's openness to the (ROW), the findings show that our oil-surplus countries are characterized by a large degree of openness through their foreign trade as indicated by the following:

The Ratio of TT/GDP

	1971	1975	1979	1982	Average
Libya	0.86	0.98	0.97	0.91	0.93
Kuwait	0.85	0.94	1.07	1.10	0.99
S. Arabia	0.89	1.02	1.02	10.2	0.98
U.S.A.	0.11	0.16	0.19	0.18	0.16

Source: Data for total trade (TT) and GDP are obtained from the IMF, IFS Yearbook 1986.

[10]The one-good dominant situation, in fact, is shared by most developing countries which are dominated by a mono-economy, where a single cash crop or mineral resource is dominating the structure of its exports. The coffee, copper and crude oil exporting LDCs are good examples.

[11]In Libya, as it is the case of most LDCs, the Central Bank of Libya (CBOL) is the principle holder of the country's international reserves (foreign assets).

[12]The unit of account of the Libyan currency was called the pound till September 1, 1971 when the dinar was introduced. The Libyan pound (L.P.) was linked to the Sterling Block, therefore, it was affected by the position of the pound sterling and reflected its strength and weakness. The link continued until the Libyan monetary authorities broke up with that Block in December, 1971. The monetary authorities chose to link the Dinar to the U.S. dollars, when the dollar was chosen as an intervention currency. The market rate of the Dinar (the rate set by the CBOL) was set at $2.80 per dinar. But the 1970's development in the international monetary system joined by the devaluations of the dollar (1971 and 1973) resulted in a "managed floating" system. In order to keep pace with the declining value of the dollar, the L.D. was appreciated twice. The dollar devaluation of 1971 led the CBOL to raise the market rate of the Dinar to $3.04 per dinar. The second appreciation followed the 1973 dollar devaluation, and again the rate was raised to $3.3778 per dinar. Both changes in the market rate of the Dinar reflected the official changes in the value of the U.S. dollar. However, since 1985 the Libyan dinar has been pegged to the SDR. See IFS, Year Book (1973), pp. 336-7, and IFS (March 1983), p. 15.

[13]The Central Bank of Libya manages the country's investment abroad via its subsidiaries, especially, the Libyan Arab Foreign Bank, which is totally owned by the CBOL.

[14]The five commercial banks operating in the Libyan economy since 1970 are (i) the National Commercial Bank, (ii) Al-Jamahiriya Bank, (iii) Al-Umma Bank, (iv) Al-Wahda Bank; and (v) Sahara Bank.

[15]For example, the credit share to general commerce dropped from

185 m/L.D. in 1977 to only 14 m/L.D. in 1979. Whereas, the credit extended to agriculture had increased from about 1.5 m/L.D. in 1970 to 9.3 m/L.D. in 1975, then jumped to 32.2 m/L.D. and 39.1 m/L.D. in 1978 and 1979 respectively. See BOL (1984) Table 12.

[16]Although the interest paid on these types of loans was extremely low, in 1966 all loans became interest-free. See CBOL Annual Report (1982), p. 43.

[17]The corporation is jointly owned by the commercial banks, the insurance companies, the General Agency for Social Securities and the General Housing Corporation. See El-Sharif (1980) p. 30.

[18]The money market dualism is presented by the coexistence of organized and unorganized markets that service the economy. The organized market is serving the urban areas whereas the unorganized one is more active in the rural areas. In the rural agricultural areas the local money lenders who charge high interest rates are the major suppliers of financial funds to farmers. See Nassef, (1972) p. 39. However, in the Libyan economy the activities of the unorganized money markets are very limited, and if they exist, the loans given are mostly interest free due to the religious influence.

[19]The inflow of oil revenue by itself has no effect on the domestic monetary aggregates because the transactions are all within the government sector. For example the sale of oil abroad will affect the CBOL's balance-sheet as follows:

Assets	Liabilities
Foreign reserves +	Government deposits +

But, it is the difference between these two items of the balance sheet that affects the monetary base.

[20]When the government spends in the domestic economy via its purchases of goods and services from the private sector, the government deposits will be transferred to the private sector. These changes in government deposits reflect the fiscal actions of the government.

Another important factor affecting monetary growth in Libya is private sector imports. When the private sector imports goods and services, there will be a corresponding reduction in the foreign assets holdings of CBOL in exchange for domestic currency. Thus, the private sector imports have a contractionary effect on the domestic money supply and consequently play an important stabilizing role against the government expansionary monetary policy. However, due to a limited economic capacity to absorb imports, escalating domestic public spending has, in fact, outweighed the private sector imports, hence resulted in noticable acceleration in monetary growth. See A. Darat (1980) p. 12 and CBOL, Economic Bulletin (Jan-Mar 1984), tables 14 and 29.

[21]Prior to 1960 the bank rate was set at 4 percent, then it was raised to 5 percent on October of 1958. In August 1960 the rate was raised again to reach 6 percent. The final use of this instrument was February 1961, when the rate was reduced to 5 percent which remained unchanged since that date. See IMF, IFS (1980).

[22]The Banking Law No. 4 of 1963 requires a compulsory legal reserve requirement on commercial banks' deposit liabilities that ranges between 10 and 40 percent on demand deposits and from 5 to 20 percent on time and saving deposits.

[23]The liquid assets have been redefined on May 1970 to consist of vault cash (domestic and foreign) and deposits in the commercial banks and the CBOL. Baryun (1980) p. 36. The liquidity ratio was set up at 20 percent during 1958-66, then was raised to 25 percent on the 1966-70 period. See CBOL Annual Report (1972/73) p. 70.

[24]For a detailed itemization of credits extended to the different sectors of the economy. See CBOL Economic Bulletin (January-March, 1984), table 12.

[25]However, since April 1980, which is beyond our period the CBOL has adjusted the interest payment to savers in its effort to encourage savings, and removed the maximum limits for interest earning for savings. The decision covered both the terms of the level and the varieties of the rates according to maturity. The Bank, therefore, removed the 5000 L.D. limit on interest earning on savings. Since

March 9, 1981, the maximum limits for interest rates given to saving depositors was raised to 5 percent. Meanwhile, the rates on time deposits become: (i) for 1-3 months short-term deposits is 5 percent; for 3-6 months is 5 1/4; and for 6-12 months is 5 1/2 percent; (ii) for medium-term deposits of one year the payment is 6 percent; 7 percent for two years and 9 percent for more than four years deposits. See CBOL Economic Bulletin (July-December 1980) p. 10.

[26]Government securities did not exist prior to 1973, and since that year their market is still limited to the banking system.

[27]The factors which influence the behavior of the money multiplier are the commercial banks, individuals and central bank. This topic is studied in more detail in Chapter III.

CHAPTER III

THE MONETARY APPROACH TO THE BALANCE OF PAYMENTS

Introduction

Since the 1960s, the international economy has witnessed fundamental changes such as expansion in the international financial integration and the breakdown of the Bretton Woods-based international financial system in the early 1970s.(1) These changes in the international economic scene have stressed the essential role played by the monetary forces and reflected the dissatisfaction with the macroeconomic apparatus which was still dominated by the inherently Keynesian thinking and its capability of providing a satisfactory explanation of the current economic problems [Wilson (1986)]. The major changes in the international economic relations stressed the need for a more integrated treatment of the BOP which emphasized the role of money and capital in international payments. The "monetary approach to the balance of payments" (MABOP) is a newly developed theory of the BOP. Payments adjustment is viewed in terms of monetary adjustment instead of via relative price and income changes. By identifying the BOP problem as a monetary phenomenon, the "new" approach presents both a theoretical and an empirical alternative to the analysis of the BOP issues.(2) The monetary approach, by integrating the current and capital accounts into the overall money account of the BOP, reformulated the BOP theory in a

general equilibrium approach and underlined the emphasis on the implication of monetary theory on the international economy. The MABOP stresses the importance of monetary variables in the BOP determination. It uses domestic monetary equilibrium conditions to derive an explanation of the overall BOP position of a country, a role which was ignored by the traditional approaches.(3)

In contrast to the traditional approaches, the monetary approach assumes the inability of the monetary authorities to sterilize the monetary flows associated with the overall BOP surpluses or deficits so that the flows do influence the money supply [Johnson (1972)]. A disequilibrium in the BOP expresses a phase of stock adjustment in the money market (not an equilibrium flow as seen by the traditional approaches) and such a stock disequilibria initiates transitory adjustment flows [Fausten (1979)]. This explains why the monetary approach focuses on the stock formulation of the demand for and supply of money within the context of a simple macroeconomic general equilibrium model. The monetary approach looks to changes in trade and capital flows to play merely a transitory role in the adjustment process and considers the stock equilibrium in the domestic money market as being reflected in the net balance on the money account of the BOP. Since demand for money is a demand for stock, not a flow,(4) a variation in the supply of money relative to the demand for it is associated with BOP disequilibrium, Therefore, in the event of a monetary disturbance the MABOP states that the foreign reserve variable will tend to carry the adjustment burden of equating the demand for and supply of money. Thus, the proponents of the approach argue that changes in foreign reserves can be explained by the variables contained in the model of the

sector without the need for referring to the variables conventionally used in the BOP analysis [Dornbusch (1971), Johnson (1972, 1976a), and Kemp (1975)]. Therefore, the monetary approach considers the role of demand for and supply of money stock the central factor in the BOP adjustment mechanism and relies on the fundamental empirical assumptions [Johnson (1975, 1977)]: (i) the existence of a stable demand for money; and (ii) given the economy is under a fixed rate regime, the domestic component of the money supply is determined independently of demand and is subject to policy control.(5)

The task of this chapter is to present a comprehensive survey of the major theoretical development of the monetary analysis of the BOP adjustment. It attempts to cover the theoretical propositions and assumptions on which the monetary analysis to the BOP are based. It explains how the adjustment mechanism works. It introduces and develops a basic monetary model which is usually used in empirical studies. Finally, the chapter will present a general overview of the policy implications of the model and an evaluation and critique of the views of the monetary approach.

The Fundamental Propositions

The monetary approach asserts essential propositions concerning the nature of the balance of payments which are the following:

(1) The approach's basic assumption views the BOP as an essentially (but not exclusively) monetary phenomenon in a context of a general equilibrium analysis.(6) Thus, at least in the long run, it considers the monetary factors to play a decisive role in the disturbance and the adjustment of the country's external balance. The

approach centers its activity on the direct influence of the money market disequilibrium on the BOP position [Johnson (1977c)]. It regards the BOP disequilibrium as originating and reflecting imbalances in the domestic money market which spilled over into the external sector of the economy. Such monetary disturbance cause the BOP imbalances and produce the processes through which these imbalances are eliminated. By doing so, the monetary approach relates the BOP directly to the demand for and supply of money [Girton and Nattress (1977)]. Because the monetary approach views demand for money as a stock demand, it considers BOP deficits or surpluses as stock adjustment to money market disequilibrium, or as continuous flow disturbances resulting from ongoing stock adjustment [Tullio (1974)]. Accordingly, the MABOP views a deficit in the BOP as being a result of an excess in the domestic money stock over what the society desires to hold. Hence, in a world of fixed exchange rates, the excess supply of money flows abroad and produces a deficit in that country's BOP. An excess demand over the country's domestic money supply leads to a BOP surplus. Therefore, a positive excess demand for money is satisfied by inflow of international money. The BOP flow is one of the mechanisms by which actual money imbalances are adjusted to their desired levels, and the resulted equilibrium in the money market leads to a corresponding equilibrium in the BOP.(7) Johnson (1976, pp. 21-22) summarized this basic proposition by stating "...since the money account is determined by the excess flow demand for money...the BOP is essentially a monetary phenomenon."

(2) The monetary approach looks at the BOP from the "bottom up" in contrast to the traditional approaches which view the BOP from "top down." It lumps together all the "above the line" items that constitute

the current and capital accounts without any analysis or explanation of these separate balances. By identifying the BOP with those items "below the line," the monetary approach focuses its attention on the official settlement balance. It defines the BOP as the changes in the money account, and focuses on the effects which a change in the overall balance has on the country's monetary base and its domestic money supply. Accordingly, the BOP contains all the transactions that reflect the adjustment of actual money balances to their desired level. By doing so, the approach is able to arrive at a meaningful and relevant analysis of the BOP issues.

(3) The adjustment mechanism is assumed instantaneous and automatic in the sense that demand for money always equals its supply. Therefore, any BOP imbalance (or exchange rate change) represents a phase in the automatic stock adjustment in the money market. It reflects a disequilibrium between actual and desired money balances. In fact, the BOP is seen by the monetary approach as a part of an automatic adjustment process that works to restore equilibrium whenever a monetary disturbance takes place [Johnson (1977c)]. The monetary disturbance spills over into the external sector where the BOP surplus or deficit is treated as part of the adjustment process towards equilibrium in the money market and the BOP.

(4) The monetary approach is concerned primarily with the long run in which the economy is assumed to be at a state of full employment and the price levels and interest rates in all countries move rigidly in line with one another. Thus, the purchasing power parity (PPP) and interest rate parity are assumed to hold.

The Adjustment Mechanism

The monetary approach views the BOP as part of an automatic adjustment process that works to restore equilibrium in the money market, whenever, the state of equilibrium is disturbed. Accordingly, any disturbance in the monetary sector will spill over into the external sector and become a deficit or surplus in the BOP. The monetary approach analysis is based on a general equilibrium framework and the assumption of monetary equilibrium at least in the long run.(8) In addition to the money market equilibrium, the monetary analysis of the BOP extends to the money supply process. It utilizes the compositional definition of the base money in an open economy and combines it with stock flow equilibrium concept and the arguments of the demand for money function to arrive at a BOP which explains the BOP as a monetary phenomenon. It shows the overall BOP as a flow variable which represents an adjustment between stock variables or changes in net foreign assets of the central bank.(9) By assuming a stable demand for money function to exist, the BOP determinants are then identified as dependent upon the demand for and supply of money. Therefore, starting from an initial equilibrium position, the monetary approach's presentation seeks to explain and illustrate the process of adjustment towards equilibrium when an exogenous shock disturbs the system from equilibrium.

The adjustment process, or market clearing mechanism to restore equilibrium whenever a disturbance occurs, differs whether the economy in concern is closed or open to the rest of the world. In a general equilibrium context, when a disturbance takes place in a closed economy, equilibrium is restored in a Walrasian world through changes in relative

prices of goods traded in the market[10] [Aghevli and Khan (1977)]. However, if the economy is open through foreign trade and payments, the market clearing process would work through not only the domestic market but the world market as well. The adjustment process in an open economy as viewed by the monetary approach goes beyond mere emphasis on the role of money in addition to real variables to the extent that it considers the monetary aspects as the core and essence of the adjustment mechanism [Kreinin and Officer (1978)].

The adjustment process which is presented by the monetary approach can be explained with the help of Walras' law, which states that for a system to be in equilibrium all excess demand in the whole economy must sum up to zero.[11] According to the MABOP, the BOP adjustment mechanism works in the following manner: Suppose the economy is initially in a state of general equilibrium where all excess demands sum up to zero. If the country runs a deficit in the current account, it means the country has an excess demand for goods and services. Since her imports exceed her exports, the excess demand in the real market is met by the outside world. If she runs a deficit in the capital account, it is an indication of an excess demands in her bond markets, which are satisfied by importing more securities than she is exporting to the rest of the world. But, when a country runs a deficit in her overall balance (BOP), according to Walras' law, she must have an excess supply in her money market. This follows since in a three-market economy according to Walras' law when two markets have excess demands, the third market must have an excess supply.[12]

The loss of foreign reserves is viewed by the monetary approach as the way in which a country "exports" money to the external world. This

shows why it views the BOP disequilibrium as the mechanism by which an excess supply of (demand for) money is removed from the domestic money market. In brief, an excess demand for money implies a BOP surplus, while a deficit in the BOP reflects an excess supply of money in the money market [Wanniski (1975), Johnson (1977b) and Kenen (1986)]. Therefore, when an exogenous shock occurs, the adjustment process starts and keeps on working until the excess demand for (supply of) money vanishes and the flow demand for money equates the flow supply of it and equilibrium is restored. At that point the flow demand for goods and the flow demand for bonds each equal their flow supplies and the economy achieves equilibrium as well as the BOP.

The link between the money market conditions and the overall BOP may be illustrated by a simple graphical exposition.(13) As explained above, any disturbance in the money market will be corrected through the BOP adjustment process. To explain graphically the path to restore equilibrium in the money market and then the BOP, suppose the starting point is the initial equilibrium given by:

$$MD = MS = DC + R \tag{3.1}$$

where:

MD = demand for money

MS = money supply

DC = domestic credits

R = foreign reserves

This equilibrium relation is plotted in Figure 3(a), by the line MM, where the demand for money OM equals the supply of it. Now assume the demand for money is constant since all arguments of the demand for money

function are either given parameters as the interest rate and the price level, or at its employment level such as output, $\overline{MD}$.[14] From equation (3.1), we obtain:

$$R = \overline{MD} - DC = M - D \qquad (3.2)$$

In Figure 3(a) the horizontal axis shows the demand for money (MD = M) and the domestic credit (DC = D), while money supply (M) and foreign reserves (R) are measured along the vertical axis. At the initial equilibrium in the money market the stock of domestic credit is OD and the stock of foreign reserves is OR (=DM). Now consider an exogenous shock, where the monetary authority increased the quantity of domestic credit by DD_1. If foreign reserves do not adjust instantaneously, the economy shifts from point E to E_1 on the new line M_1M_1. This action by the monetary authorities increases the money supply to DM_1 and produces an excess supply of money equals MM_1 ($=OM_1 - OM$). The economy moves to point E_1 which is a point of disequilibrium. In order to restore equilibrium in the domestic money market, society needs to dispose that excess quantity of money. The adjustment process to restore equilibrium must occur over time where society gets rid of the excess money by means of buying foreign goods, the direct effect is running a BOP deficit. The outflow of foreign reserves, over time, reduces the quantity of money and eliminates the excess supply. The adjustment process works over time and the change in foreign reserves tends to reduce reserves from OR to OR_1. The adjustment process is shown by the pointed arrows through movements from E_1 to E_2, and at this final step, adjustment ends where money supply returns back to OM and the money market is at the new equilibrium position indicated by point E_2. The new state of

equilibrium in the money market is a long-run equilibrium, where all excess money balances have been spent, hence, what society desires to hold equals the actual money stock.(15)

Figure 3(b) shows a brief presentation of the adjustment process using a stock-flow relationship as summarized in equation (3.4) below:

$$BOP = R_t = S = \lambda(MD - MS) \tag{3.3}$$

$$R_t = \lambda(\overline{MD} - MS) = \lambda(\overline{MD} - DC) - \lambda R \tag{3.4}$$

The balance of payments is given by the flow of foreign reserves R_t while R is the stock of foreign reserves. The relation given by equation (3.3) is presented by QQ in Figure 3(b). The first term in equation (3.4) gives the position of the QQ curve which shows the difference or the gap between the money society desires to hold and the quantity of liquidity provided by the monetary authority. An increase in domestic money (DC) shifts QQ downward and vice versa. The negative slope of the QQ line reflects the inverse relation between the stock of foreign reserves and the BOP. Starting from an initial equilibrium in the money market (no saving nor dissaving), the BOP is in equilibrium and the stock of foreign reserves is OR as shown in Figure 3(a), and Figure 3(b). As the monetary authorities raise the domestic credit, the decision disturbs the initial monetary equilibrium, hence, shifting QQ line down to Q_1Q_1, and leading to a BOP deficit given by OK. Over time the economy moves toward equilibrium as indicated by the movement along Q_1Q_1, the path shown by the pointed arrows, until the stock of foreign reserves falls to OR_1. At that point, the deficit in the BOP is completely eliminated, the changes in reserves (BOP) equals zero and the money market returns to equilibrium [Kenen (1986), and Batiz and Batiz

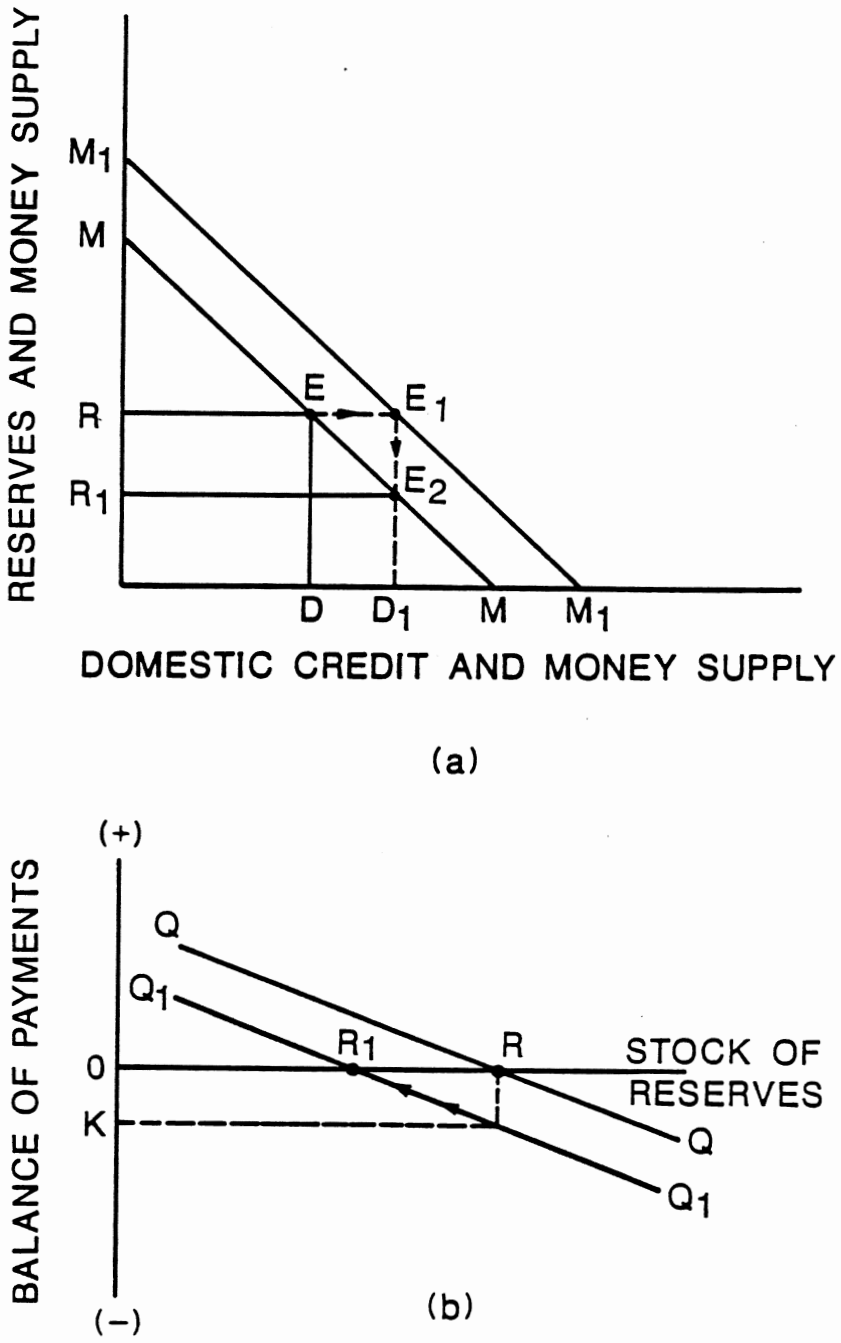

Figure 3 (a). Adjustment in the Money Market

(b). Credit Creation, Reserves and the BOP

(1984)]. The adjustment process, which is carried out in an automatic manner, enables us to concentrate on the causes behind the foreign reserves flow as presented by the money market imbalances. The BOP disequilibrium is viewed as a continuous flow disturbance that results from ongoing stock adjustment [Tullio (1974) and Shone (1980)]. Finally, the achievement of flow equilibrium will eventually guarantee the achievement of stock equilibrium.(16) However, the monetary approach analysis considers the BOP imbalance as self-correcting and transitory in nature unless continuously disturbed by exogenous shocks such as a continuous change in domestic money (domestic credit) in the case of stationary economies and/or changes resulting from real output growth in the case of dynamic economies [Wilford (1978)].

As indicated by Robin (1979), the monetary approach views the BOP as having two important aspects: (i) the monetary disequilibrium reflects and explains any BOP surplus or deficit;(17) and (ii) the BOP is the channel or mechanism through which monetary adjustments are carried out. For these reasons, the monetary approach analysis assumes a consistent relation between the rate of growth of the money stock and the rate of growth in the determinants of the demand for money.

The type of adjustment, in fact, depends upon whether the economy is under fixed or flexible exchange rates system. The adjustment process under the fixed rates regime works through the BOP surplus or deficit as explained above. While under the flexible exchange rates regime, the monetary approach shifts the focus from determining the BOP to the determination of the exchange rate. Therefore, the exchange rate not the BOP becomes the key variable in the adjustment process.(18)

In the next section a simple monetary model is to be used to derive

a BOP equation. The purpose is to stress and to focus on the role of the monetary forces on the overall BOP adjustment process, instead of the partial equilibrium relative price or real aspects of the BOP adjustment adopted by the non-monetarist approaches. The original model of the MABOP was presented by H. Johnson (1972) and over time that model has been modified by many economists. The modifications introduced to Johnson's original model is aimed to meet the institutional constraints imposed by the conditions of the economies under consideration. However, the basic features of Johnson's model remained the same.

The Model

The MABOP framework of analysis as demonstrated above views the BOP as an adjustment to a monetary disturbance caused by exogenous forces. In an effort to illustrate the essential role of the monetary forces in the BOP adjustment mechanism we will set up a simple model of the monetary sector in the economy, then utilize it to derive an equation for the BOP as a monetary adjustment. This simple model is comprised of some behavioral relationships which explain the determinants of the demand for money, a monetary stock equation and an equilibrium condition in the money market. The model will suffice to treat the BOP as the difference or gap between the money demand and money supply in the economy. The simple monetary model to be used is presented as follows:

$$(M^d/P) = m^d = f(y, c) \tag{3.5a}$$

$$M^d = P \cdot f(y, c) \tag{3.5b}$$

$$M^s = m \cdot H \tag{3.6}$$

$$H = DC + R \tag{3.7}$$

$$M^s = M^d \tag{3.8}$$

Equation (3.5a) shows the real demand for money balances, (M^d/P), as a function of real income, (y), and an opportunity cost variable of holding money balances, (c), while the nominal demand for money, (M^d), is given by equation (3.5b). Equation (3.6) shows the money supply, (M^s), as a multiple of the base money (the high-powered money), (H), and the money multiplier, (m). Equation (3.7) states that the base money equals to the net level of foreign reserves, (R), plus the net domestic credits creation by the central bank, (DC). Equation (3.8) expresses the market clearing condition in the money market.(19)

The equilibrium condition which is given by equation (3.8) requires that demand for money equal the supply for it, and thus implies a zero excess demand for money, a condition that must be met in the long run. However, in the short run the domestic money market may exhibit a temporary disequilibrium which could lead to an excess demand or an excess supply of money [Batiz and Batiz (1985)]. If the money market is in disequilibrium an automatic self-correcting mechanism starts to work, since the society begins to adjust its money balances in an effort to equate actual and desired money balances. The adjustment process works automatically via the flow variables to correct the disturbance and push the monetary forces back to an equilibrium position [Humphrey and Keleher (1982)]. This simple model treats all goods as tradables. Because the economy is assumed to be a small open one which follows a fixed exchange rates regime, it implies that all prices (including interest rates) are exogenously determined. The model also assumes the

real sector output is affected only by real variables such as the available resource base and the existing state of technology and other variables which are exogenous to the monetary sector. We will start the analysis by studying the money demand function, followed by the money supply process. Then we derive the BOP equation which will be used in the empirical analysis of the next chapter.

The Demand for Money Function

The existence of a well-specified demand for money function is a key assumption in the MABOP theory. Almost all the various theories proposed to explain the public's demand for money indicate the existence of stable relations between the stock of money demanded and few essential economic variables, as presented by empirical results [Goldfield (1973), Judd and Scadding (1982) and Boorman (1985)]. The stability issue as expressed by Judd and Scadding (1982, p. 993) states that:

> ...a stable demand for money function means that the quantity of money is predictably related to a small set of key variables that link money to the real sector of the economy.).

The standard form of the money demand function which has emerged from the theoretical and empirical studies is similar to equation (3.1a) of the model. The demand for money is a demand for stock, it is a derived demand for the services which flow from holding that stock of money. The postulated real demand for money function is specified as follows:

$$(M^d/P) = f(y, i) \qquad f_y > 0 \qquad f_i < 0 \qquad (3.9)$$

where:

M^d = the stock of nominal demand for money.

P = the domestic price level.

i = the domestic interest rate.

y = the real current income, or real permanent income or real wealth.

Equation (3.9) expresses the real demand for money, (M^d/P), as a function of real income, y, and interest rate, i, as the appropriate measure of the opportunity cost of holding idle money balances. The real income argument is assumed exogenous and positively related to the quantity of money demanded. Although the demand for money theories differ on the type of interest rate used, all theories indicate that interest rate is negatively related to the quantity of money demanded.(20) The demand for money function is generally written in real terms based on the assumption that the function is homogeneous of degree one in prices. The homogeneity property implies: (i) the public is free of money illusion, therefore, society is not able to distinguish between real and nominal economic magnitudes; and (ii) long run neutrality of money, which means in the long run output is determined independently of the behavior of money [Humphrey and Keleher (1983)]. To transfer equation (3.9) into terms of growth rates, differentiate with respect to time:

$$(P\cdot\frac{dM^d}{dt} - M^d\cdot\frac{dP}{dt})/P^2 = \frac{\partial f}{\partial y}\cdot\frac{dy}{dt} + \frac{\partial f}{\partial i}\cdot\frac{di}{dt} \qquad (3.10)$$

Multiplying both sides of equation (3.10) by P and dividing them by M^d yields:

$$(\frac{P}{M^d})\cdot(P\cdot\frac{dM^d}{dt} - M^d\cdot\frac{dP}{dt})/P^2 = (\frac{\partial f}{\partial y}\cdot\frac{dy}{dt} + \frac{\partial f}{\partial i}\cdot\frac{di}{dt})\cdot(\frac{P}{M^d}) \qquad (3.11)$$

Now, multiply the first term on the right hand side of equation (3.11) by (y/y) and the second term by (i/i). This yields:

$$\frac{dM^d}{dt}\cdot\frac{1}{M^d} - \frac{dP}{dt}\cdot\frac{1}{P} = \frac{\partial M^d}{\partial y}\cdot\frac{y}{M^d}\cdot\frac{1}{y}\frac{dy}{dt} + \frac{\partial M^d}{\partial i}\cdot\frac{i}{M^d}\cdot\frac{1}{i}\frac{di}{dt} \qquad (3.12)$$

Define a dot on a variable to indicate its time derivative, i.e., $\dot{x} = dx/dt$, and the growth rate of x to be $g_x = \dot{x}/x$. Also denote the symbol ε_x to be the elasticity of demand. Therefore, expressing equation (3.12) in terms of rates of growth yields:

$$g_{M^d} - g_P = \varepsilon_y \cdot g_y + \varepsilon_i \cdot g_i \qquad (3.13)$$

To specify equation (3.13) in nominal terms, we move the growth rate of prices to the right hand side of the equation:

$$g_{M^d} = g_P + \varepsilon_y g_y + \varepsilon_i g_i \qquad \varepsilon_y > 0, \quad \varepsilon_i < 0 \qquad (3.14)$$

Equation (3.14) expresses the nominal demand for money in growth terms. The sign for the elasticity of demand for money with respect to income, ε_y, is expected to be positive, while an expected increase in interest rates reduces it. The coefficient of inflation is constrained to be one, which reflects the homogeneity assumption.

The Money Supply Process

The examination of the balance sheet of the monetary authority or the analysis of its assets and liabilities indicates that the stock of reserves money[21] (high-powered money, or monetary base) in a country equals the sum of international (foreign) reserves holdings of the

banking system and the domestic credit creation (the net domestic assets of the central bank) [Zecher (1974)]. A compact summary of a hypothetical monetary authority's balance sheet is given by Table II below:

TABLE II

A MONETARY AUTHORITY'S BALANCE SHEET

Assets			Liabilities
International Reserves	R	H	Base Money
All Other Assets	AOA	AOL	All Other Liabilities
	R + AOA	= H + AOL	

The domestic credit creation, DC, is the domestic source of base money which by definition: DC = AOA - AOL. The item AOL is all liabilities other than base money.(22) The base money consists of two major components, the international reserves, (R), and the domestic source given by domestic credit, (DC), as shown by equation (3.7) in the model. From the summarized balance sheet of the monetary authority given by Table II, we arrive at the base money equation (3.7) as follows:

$$H = R + (AOA - AOL) = R + DC \qquad (3.7)$$

It is clear that changes in the monetary base are associated with changes in international reserves and/or changes in the domestic credits variable, (DC).

Notice, in a closed economy R = 0, therefore, any change in the base money is linked to the changes in DC. In that case, the monetary authority is able to exert control over the monetary base, hence, the money supply can be used as an instrument of monetary control. However, once the economy is opened to foreign influence via foreign trade and payments R is not generally equal to zero.(23) In such a case only the domestic source of the monetary base, DC may be controlled by the monetary authorities. However, the MABOP asserts that the control over domestic credit will be fully offset by inflows and outflows of foreign reserves in the long run.

If domestic credit is largely composed of government debt which is held by the central bank, the credit creation may be looked at as a traditional form of debt monetization. Then changes in domestic credit will be ultimately constrained by the budget deficit and net sales of government securities. Hence, changes in domestic credit could be alternatively defined as:

$$\Delta DC = (G - T - B) \tag{3.15}$$

Therefore, a rise in government spending (G), ceteris paribus, tends to increase domestic credit (DC), whereas more borrowing from the private sector (domestic or foreign) (B), and tax, (T), tend to reduce domestic credit [Akhtor (1979)]. This alternative approach to domestic credit establishes a systematic relation between domestic credit and the fiscal policy structure. As equation (3.15) indicates, changes in domestic

credit, (ΔDC) are determined by fiscal constraints.[24] The above analysis considers the creation of domestic credit a "residual" of the fiscal policy variables. This implies that, whenever $G > T + B$, the deficit in the budget needs to be monetized by the central bank's creation of domestic credit. Therefore, unless a ΔG (change in G) is completely offset by an exact Δ(T and B), then the difference, which is ΔDC (change in DC), must be met by the central bank's creation of domestic money to finance that government budget deficit [D. S. Wilford (1977)]. This analysis shows how fiscal policy variables are linked to foreign reserves flow, since changes in R or DC lead to changes in the base money which causes change in the money supply.

In a world of fractional reserve system, the banking sector can create money stocks according to the process which is indicated by equation (3.6) of this simple monetary model. Now, the substitution of equation (3.7) into equation (3.6) produces the money supply function:

$$M^S = m \cdot H = m \cdot (R + DC) = m \cdot R + m \cdot DC \qquad (3.16)$$

Equation (3.16) shows the money supply process in which the money stock equals the multiple of the base money, H, and the money multiplier, m. The base money consists of two components which indicate the domestic and foreign sources of money. The money multiplier is assumed to summarize the behaviors of the private sector, including the financial institutions, concerning the composition of their assets holdings and the monetary authorities' policy decision (i.e. changes in reserve requirement, the discount rate and the moral suasion)[25] [Herring and Marston (1977)]. Taking time derivatives and totally differentiating equation (3.16) with respect to time yields:

$$\frac{dM^S}{dt} = m \cdot \frac{dR}{dt} + R \cdot \frac{dm}{dt} + m \cdot \frac{dDC}{dt} + DC \cdot \frac{dm}{dt} \qquad (3.17)$$

In order to transform equation (3.17) in terms of growth rates, let us start by multiplying the two sides of the equation by $1/M^S$. Using $M^S = m(R + DC)$ in the right hand terms:

$$\frac{dM^S}{dt} \cdot \frac{1}{M^S} = \frac{m}{m(R+DC)} \cdot \frac{dR}{dt} + \frac{R}{m(R+DC)} \cdot \frac{dm}{dt} + \frac{m}{m(R+DC)} \cdot \frac{dDC}{dt} + \frac{DC}{m(R+DC)} \cdot \frac{dm}{dt} \qquad (3.18)$$

Collecting terms in the right hand side simplifies equation (3.18), and yields:

$$\frac{dM^S}{dt} \cdot \frac{1}{M^S} = \left(\frac{R}{R+DC} + \frac{DC}{R+DC}\right) \cdot \frac{1}{m} \cdot \frac{dm}{dt} + \frac{1}{R+DC}\left(\frac{dR}{dt} + \frac{dDC}{dt}\right) \qquad (3.19)$$

Multiply the second term in equation (3.19) by (R/R) and the last term by (DC/DC), then making the necessary reduction will lead to transform equation (3.19) into terms of growth rates. Define $g_x = (1/x) \cdot dx/dt$, the money stock equation given in terms of growth rates is obtained as follows:

$$g_{M^S} = g_m + \frac{R}{R+DC} \cdot g_R + \frac{DC}{R+DC} \cdot g_{DC} \qquad (3.20)$$

Equation (3.20) shows that the rate of growth of the money supply is equal to the summation of the rates of change of the money multiplier and the weighted average of the rates of change of net foreign reserves and net domestic credits.

Now, an equation which expresses the BOP as a monetary phenomenon

may be derived from equation (3.20). Expressing equation (3.20) in terms of the rate of change in the foreign reserves variable produces the following BOP equation:

$$(\frac{R}{R+DC})g_R = g_{M^s} - g_m - (\frac{DC}{R+DC})g_{DC} \qquad (3.21)$$

Equation (3.21) shows the main characteristics of the MABOP theory. Given, the economy is under fixed exchange rates, the appropriate measure of the BOP is the rate of change in foreign reserves holdings of the central bank.

In order to explain the BOP adjustment mechanism as a result of disequilibrium in the domestic money market, the monetary approach uses: $g_{M^s} = g_{M^d}$ which is the market equilibrium condition of equation (3.8) expressed in terms of growth rates. Resorting to the market equilibrium condition and substituting the nominal demand for money as flow for the growth of the monetary stock into the BOP equation (3.21), yields,

$$(\frac{R}{R+DC})g_R = (g_P + g_{m^d}) - g_m - (\frac{DC}{R+DC})g_{DC} \qquad (3.22)$$

Equation (3.22) expresses the BOP as a function of the nominal demand for money, the money multiplier and the nominal supply of domestic money, where all variables are given in terms of growth rates. Actually, the variables are presented in terms of adjustments to different levels of stocks, or rates of changes in stocks. In essence these variables are flow variables since a rate of change in a stock is a flow variable. This explains, why the monetary approach resorts to the flow equilibrium condition in the money market to derive the BOP

adjustment function which is given by the reserve flow equation (3.22). This equation indicates that the long run steady state equilibrium takes place as the actual money stock equals the desired demand for money.(26)

The money market equilibrium condition and the correct specification of the demand for money function are the cornerstones in treating and deriving the BOP relationship as a monetary adjustment. Therefore, the basic equation which constitutes the theoretical foundation of the MABOP theory can be obtained when we substitute the real money demand of equation (3.13) for g_{m^d} in the reserve flow equation (3.22). Thus, we arrive at the fundamental equation used often in testing the monetary approach as flows:

$$(\frac{R}{R+DC})g_R = g_P + \varepsilon_y g_y + \varepsilon_i g_i - g_m - (\frac{DC}{R+DC})g_{DC} \qquad (3.23)$$

$$\varepsilon_y > 0 \quad \text{and} \quad \varepsilon_i < 0$$

Given the expected signs of the elasticities, any rise in real income and inflation leads to reserves inflow or an improvement in the BOP. A rise in the growth rate of the interest rate, the money multiplier and the domestic credits will cause a reserve outflow, hence, worsen the BOP position(27) [Johnson (1972), Aghevli and Khan (1976) and Wilford and Wilford (1978)]. The model assumes that causality runs from the demand for money to the supply of it, since excess domestic money supply over demand for money results in reserves outflow, i.e., $M^s > M^d \Longrightarrow$ BOP $<$ 0, whereas, an excess money demand leads to reserves inflow, i.e. $M^d > M^s \Longrightarrow$ BOP $>$ 0 [McNown and Wallace (1977)]. The model given by

equation (3.23), is known as the reserve flow equation which is the cornerstone in the empirical testing of the MABOP.

The Empirical Estimation Methods

The MABOP analysis is used for a large body of empirical works collected in two important books: [Frenkel and Johnson (1976) part II and Putnam and Wilford (1979) part I]. The actual estimation of the BOP model equations (3.22) and (3.23) may be carried out by two basic estimation methods, which we denote as direct and indirect estimation methods, as presented below:

The Direct Estimation Method

In this method we regress the dependent variable $(R/R+DC)g_R$ on all the independent variables in equation (3.23), after adding an error term. Using this single equation model to test the BOP as monetary adjustment we obtain:

$$(\frac{R}{H})g_R = \alpha_1 g_P + \alpha_2 g_y + \alpha_3 g_i + \alpha_4 g_m + \alpha_5 (\frac{DC}{H})g_{DC} + e \qquad (3.24)$$

The parameters in equation (3.24) are expected to carry the signs and values: $\alpha_1 = 1$, $\alpha_2 > 0$, $\alpha_3 < 0$ and $\alpha_4 = \alpha_5 = -1$. The disturbance or error term $e \sim N(0,\sigma^2)$, and $H = R + DC$. The key assumption of the monetary approach is the negative one-to-one relation between the growth in net foreign assets, g_R (BOP) and the growth in net domestic credits, g_{DC}. Both the rates of growth in the money multiplier, g_m, and net domestic credits, g_{DC}, are treated as exogenous policy variables.

The Indirect Estimation Method

This method is carried out in two phases: (i) the real demand for money function is independently specified and estimated, i.e. $(M^d/P) = m^d = f(y,i) + V$. The estimated values of real demand for money, $(\hat{M}^d/P)$, are transformed into growth terms, $g_{\hat{m}^d}$. Then the generated series of predicted real demand for money, in terms of growth rates, is substituted for the g_{m^d} in equation (3.22). (ii) In phase two, we regress the dependent variable, of equation (3.22) on the independent variables after accounting for phase one. Using this single equation model to test the BOP as a monetary adjustment by the indirect method is presented as follows:

$$(\frac{R}{H})g_R = \beta_1(g_{\hat{m}^d} + g_P) + \beta_2 g_m + \beta_3(\frac{DC}{H})g_{DC} + \mu \qquad (3.25)$$

The expected signs and values of the parameters in equation (3.25) are: $\beta_1 > 0$, $\beta_2 = \beta_3 = -1$ and the error term $\mu \sim N(0,\sigma^2)$. The crucial argument of the monetary approach is presented by the negative one-to-one relation between the growth in net foreign reserves (BOP) and the growth in net domestic credits. Finally, it should be indicated that the use of the alternative approach to defining net domestic credit, i.e. $\Delta DC = (G - T - B)$, will have no effect on the type of estimation method chosen. Moreover, the break down of the money multiplier into its different influences, i.e. $m = (1 + c)/(r^{\ell} + r^{e} + c)$, will not affect the estimation method chosen to conduct the empirical testing of the reserve flow equations (3.24) or (3.25).[28]

Policy Implications and General Evaluations

The Policy Implications of the MABOP

The monetary approach views any external imbalance as an automatic, self-correcting process. Therefore, any policy action to correct the BOP disequilibrium position is considered unnecessary and mainly ineffective except in the short run. Only changes in the rate of growth of domestic credits are the possible effective remedy in the long run [Kreinin (1979)]. The effectiveness of BOP policies must be evaluated in the context of their impact on the monetary equilibrium. Therefore, policy measures such as changes in the exchange rate, tarrifs, quotas, and direct exchange rate controls, are all seen as transitory measures which work their influences strictly via their impact on the domestic price level. A change in the price level causes an imbalance in the domestic money market, hence, producing a temporary stock imbalance between supply and demand for money. The resulting monetary disequilibrium is reflected in foreign reserve flows or BOP surpluses or deficits which continue until the monetary equilibrium is restored. The major policy implications are: (1) Devaluation: Changes in the exchange rate or devaluation raises the domestic price level and produces an excess demand for money. The monetary approach, by introducing the money account, permits the monetary imbalance resulting from devaluation to be reflected in the overall BOP. This view differs from the traditional approaches which limited the effects of devaluation to the BOT [M. Whitman (1975)]. The monetary approach views the effects of devaluation as being transitory, unless devaluation is continuously repeated.

The QQ curve in Figure 3(b) is reproduced in Figure 4 which can be

utilized to demonstrate the effects of devaluation on the BOP according to the monetary approach analysis. A devaluation raises the domestic price level, hence, reduces the real money-balances and creates an excess demand for money. If the new demand for money is not satisfied from domestic sources, an inflow of foreign reserves may occur and produce a BOP surplus (on the BOT and/or the capital account). The increase in the demand for money shifts the QQ curve upward to Q_1Q_1 as shown in Figure 4. However, this BOP surplus will not last. The inflow of reserves increases the monetary base, hence, the money supply, and drives the economy down along the Q_1Q_1 curve as indicated by the pointed arrows. The inflow of reserves will cease, hence, the BOP vanishes as the stock of foreign reserves reaches the new level OR_1. At that point equilibrium in the money market is restored and the BOP surplus is completely eliminated [Kreinin (1979) and Kenen (1985)]. The above exposition explains why the monetary approach considers devaluation to have only transitory effects; a single change in the exchange rate is not capable of bringing about a lasting change in the BOP. In fact, creating a continuous favorable BOP position requires either repeated devaluation or keeping the restraint on the growth of the domestic component of the base money [Johnson (1972)].

(2) Tariffs: A tax on imports in the form of a tariff causes the domestic price of the imported commodity to rise, therefore, the effects of an import tariff are similar to that of devaluation. Both policy measures tend to create an excess demand for money balances resulting from domestic price increases. And unless the rise in money demand is met by domestic sources, it will lead to reserves inflow. Thus, an excess demand causes a transitory BOP surplus which lasts until

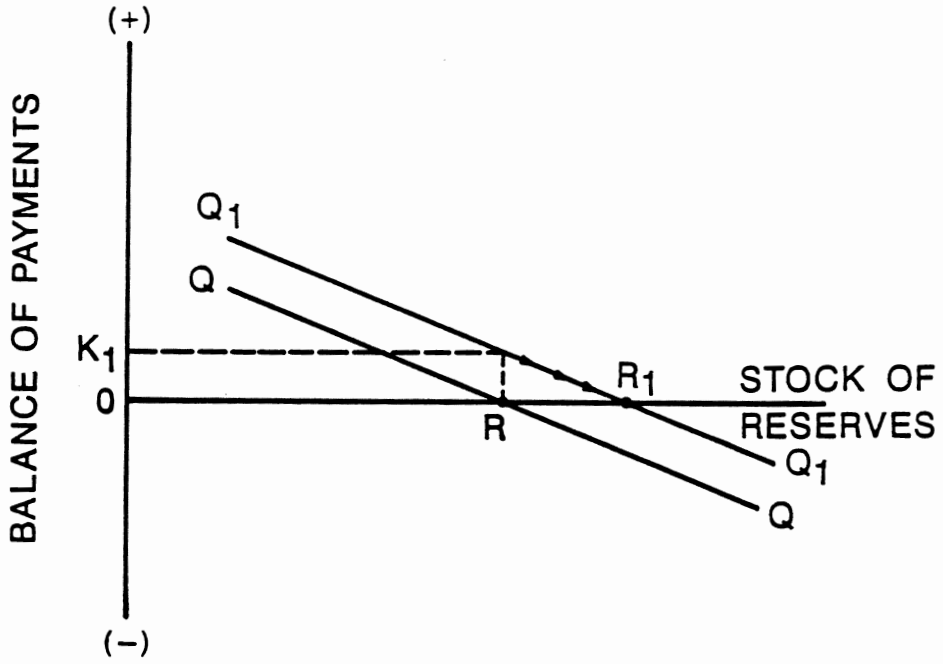

Figure 4. Devaluation in the Monetary Views

equilibrium in the domestic money market is restored through the BOP adjustment process [Kreinin (1975)].

(3) Quotas and Direct Exchange Control: Both measures do interfere with trade and reduce the volume of exports, hence leading to a temporary improvement in the external balance. Their most obvious effects tend to raise the domestic price level and increase demand for money. The created excess demand for money will either be met by expanding domestic money or by foreign money through a transitory favorable BOP position which disappears as soon as the monetary equilibrium is restored.

So, the monetary approach considers all policy measures concerning the BOP as being of monetary nature and must be transitory. The effects of these measures are shown through raising the domestic price level and work via changes in the demand for money balances. Therefore, these policies have limited effects, and last only until the monetary disturbance is adjusted through international reserves inflow. In other words, the effects of devaluation, tariffs, import quotas, exchange controls and other interferences with trade and payments, practiced for BOP reasons should be of transitory nature and last only until the stock equilibrium in money market is restored. However, all BOP disequilibria may be treated by using domestic monetary policies(29) [Johnson (1972, 1977c) and Kreinin (1979)].

A General Evaluation

The monetary approach, as the traditional approaches to the BOP analysis, has been exposed to attacks and criticism. The MABOP's integration of the current and capital accounts is maintained by

invoking a rather strong assumption, namely, the existence of a stable demand for money function, which even though is not entirely unrealistic, is a very strong assumption.

W. Futur (1979) delivers a major criticism to the approach, claiming that not every foreign reserves loss or outflow is an evidence that the money stock or the domestic credit base is too large. Therefore, restraining the expansion of the domestic money supply may not necessarily reverse the reserve loss and improve the BOP position of a reserve losing country. For example, in the case where investment is the carrier of technical progress, then if demand for money is restricted and so is investment, by restraining the expansion of the money supply, it may turn out to be a counter-productive measure. Moreover, the monetary approach does not treat adequately the behavior of wages and labor mobility and their role in the formulation of the country's economic policies. An attack regarding the crucial assumption of the one-to-one negative relation between the rate of expansion of the domestic money supply and the rate of change of foreign reserves is presented by Branson (1975). He explains that since the stock of money is endogenous, the implication of an exact offset (the coefficient on $g_{DC} = -1$) between changes in foreign reserves and changes in domestic credit is inconsistent with the empirical evidence. To that he adds that some of the basic assumptions of the monetary approach are not realistic even in the case of small open economies, since some empirical evidence shows that interest rates and prices do vary from their world counterparts, hence violating the assumption of the integrated world market hypothesis.

Another major criticism came from D. A. Currie (1976) who attacked

the monetary approach's overemphasis, particularly in the long run, on the role of monetary factors in the BOP adjustment at the expense of the non-monetary factors as tariffs, devaluation and fiscal policies, of which the traditional approaches have assigned the leading role. In fact, a more sound critique falls on the approach's focus on money while almost ignoring or underestimating the importance of the real factors in the BOP adjustment mechanism. So D. A. Currie thinks, centralization on money may come as a contrast to the traditional analysis which emphasized the role of real variables while ignoring the monetary forces. However, despite the importance of the monetary factors, he thinks the monetary approach seems to go too far on focusing on money to the extent of underestimating the role of the real factors such as income, interest rates and prices, especially in the time period relevant to economic policies. The definition of the overall BOP as given by the money account which integrates the current and capital account came under attack, so is the assumption that changes in reserves entail a financing process that clears excess flow supplies and demands in the current and capital account in the BOP. The critique considers the monetarist's definition stands short of providing the useful and needed information concerning the "above the line" accounts: (i) the trade account; (ii) the service account; (iii) the short-term capital account; (iv) the long-term capital account; and (v) the private public transfers account. According to the critics the monetary approach's emphasis on the overall or net sum of all accounts as given by the money account failed to give any insight to the composition of these sub-accounts, therefore, such shortcomings may limit the prospect of the monetary approach as a general theory of the BOP. And by ignoring the

decomposition of all balances, the monetary approach may overlook matters which may turn out to be of great significance to the economy under consideration. As M. Kreinin (1979, p. 149) put this argument:

> It matters for the generation of domestic output and employment whether the source of the disturbance is in the capital account or in the goods and services account. Also, if a deficit on goods and services is continuously financed by private short-term capital, it would cause no imbalance on official reserve transactions; yet the country's foreign indebtedness would rise over time, and that may have serious economic implications.

A final point of evaluation concerns the monetary approach's specifications and limits of the adjustment process's time span. The approach suggests between one to ten years for the BOP adjustment to work out, but it focuses only on the long run final equilibrium position without describing either the dynamic path the economy follows to reach the equilibrium state or the exact time period required to reach that equilibrium [Kreinin (1979)].

ENDNOTES

[1]The 1930's were dominated by highly variable exchange rates accompanied by severe world economic depression. In fact, the volatility of exchange rates and the competitive devaluation were responsible for many of the world economic troubles of that period. The 1944 Bretton Woods Conference produced a world-wide regime of fixed exchange rates based on the U.S. dollar as a world money to which other currencies were pegged to. The Bretton Woods System, known as "the gold-exchange standard" did dominate the international monetary system until 1971. However, speculations in gold, world inflation, shortages in world liquidity and other factors accompaning the US persistent BOP deficits, all led to the collapse of the Bretton Woods System in August of 1971. That gave rise to the new floating, or more accurately the imperfect flexibility, in the exchange rate which dominated the international monetary system in the seventies and eighties. See J. E. Floyd, (1985). pp. 1-3 and Bell and Kettell, (1983), chapter two.

[2]Although the monetary approach began to take shape in the early 1970's, its roots go back to D. Hume's specie-flow mechanism, which linked the BOT to the domestic money supply.

[3]The non-monetarist approaches to the BOP theory rest on the assumption that the monetary authorities in the country are able to absorb or sterilize the monetary consequences on the BOP. Therefore, these approaches assume a country is able to avoid the effect of foreign money (reserves) influence on its domestic money supply.

[4]According to the monetary approach, money is one form of holding wealth, therefore, money demand is treated as a demand for assets. Thus, society holds money balances because money is seen as an asset or a form of holding wealth. Therefore, the demand for money is considered a stock demand and not a flow demand.

[5]The demand for money function must be stable, which means the function can be identified and estimated, independently from the money supply. For example, a change in the domestic credits, (change in the domestic money supply) will not exert any change in the specification of the demand for money function.

[6]This is in contrast to the elasticities and the absorption approaches which focused their analyses on the real sector, as presented by the current account, in a partial equilibrium framework. See Chapter III and Anne Krueger, (1969). For various concepts of the BOP analytical presentation, see P. Wilson (1986) Chapter eleven and P. Kenen (1985), Chapter eleven.

[7]The traditional approaches focus on the flows in the exchange market and what are behind them in the goods and services and assets markets. For example, the equilibrium mechanism within the current account depends on the absorption of the current flows of production by flows of consumption and investment spendings. Whereas, the surplus or deficit in trade and corrections of trade imbalances depend essentially on the relative prices between imports and domestic output. See Hodjera, (1978), p. 540, and Kenen, (1986), p. 397.

[8]It should be noted that even though equilibrium in the money market is the assumption, it is possible, at least in the short run for disequilibrium to exist. In fact, it is the difference between desired money balances and the actual money stock, or the excess demand for (supply of) money which explains the possibility of the BOP surpluses or deficits, i.e. BOP = ΔM^d - ΔDC, where DC is domestically supplied money. See Batiz and Batiz (1985), pp. 431-432.

[9]Utilizing the summary balance sheet of the central bank, we can arrive at the base money, M = DC + R, where M, the money stock, is comprised of two sources: the stock of domestic credit, (DC), and the stock of foreign reserves, (R). In flow terms $\Delta M = \Delta(DC) + \Delta R$ and defines the BOP as the change in reserves, (ΔR). Therefore, the BOP = $\Delta R = \Delta M^d - \Delta DC$, where M^d is the demand for money and Δ stands for the rate of change. Accordingly, the BOP is explained by the addition to (or subtraction from) the money balances that society desires to hold and are not provided by the monetary authorities in a form of change in

domestically supplied money. See W. T. Wilford, (1978), p. 99 and Batiz and Batiz, (1985) p. 432.

[10]According to the monetarists, in a closed economy the emphasis is on the effects of changes in the money supply on the economic activities. Therefore, the nominal money stock or its monetary base is treated as a policy instrument. Thus, the focus is on the effects of changes in the nominal supply of money on domestic prices, wages interest rates and output. Since output is assumed fixed at the full employment level, then only prices including wages and interest rates are allowed to vary [Aghevli and Khan, (1977), p. 277].

[11]Let EG, EB and EM denote excess demands in the goods, securities and money markets respectively. According to Walras' law all excess demands in the economy must sum up to zero, in essence that an excess demand in one market must show as an excess supply in one or the other market, so that:

$$EG + EB + EM = 0$$

And equilibrium in any market is defined to be where there is no excess demand. However, in a three-market economy, when two markets are in equilibrium, the third market must also be in equilibrium; e.g. if EG = 0, and EB = 0, then it follows from Walras' law that EM must be zero. See Shone (1984), pp. 110-111.

[12]When this three-sector economy has excess demands in its real and securities markets, then according to Walras's law, this economy must have an excess supply (negative excess demand) in its money market. This is true, since according to Walras' law, the economy cannot have positive excess demands in all its markets [See Kenen, (1986), p. 400]. Therefore, when the real and bonds markets achieve equilibrium, equilibrium in the money market is assumed as well.

[13]The graphical analysis draws to a large extent on the analysis presented in Kenen (1968) chapter twelve. See also Batiz and Batiz, (1985), pp. 448-449. Moreover, for simplicity the demand and supply of base money is used in the analysis given by this exposition.

[14]For a small open economy, prices including the interest rates are assumed to move in the same direction with their world counterparts in accordance with the assumption of the integrated world market hypothesis. See Frenkel and Johnson, (1976), p. 26.

[15]An excess demand for money $M^d > M^s$ implies saving by society which is done through reducing expenditure (absorption), which will lead to a surplus on the trade balance. Assuming no changes in the capital account, then the final outcome is a BOP surplus or a net inflow of foreign reserves. The inflow of reserves raises the money stock and gradually eliminates the excess demand for money. On the other hand, with an excess supply of money $M^s > M^d$, society will dissave by increasing expenditure and move the trade balance into deficit. Again, assuming the current account to be in balance, the final result is a BOP deficit. Thus, the outflow of reserves reduces the quantity of money leading over time to eliminate the excess supply of money. When equilibrium in the money market is restored, it implies a BOP equilibrium, and there will be neither saving nor dissaving i.e. $s = \lambda(M^d - M^s) = 0$, where s is saving and λ is the speed of adjustment or the rate at which society saves to close the gap or the difference between the desired money holdings and actual stock of money. See Kenen (1986), p. 408 and Wanniski, (1975), p. 35.

[16]Equilibrium could be a short- or long-run one, therefore, a situation where no excess flow demand exists in an economy indicates a short-run equilibrium. While a long-run equilibrium indicates a situation where excess stock demands are absent. However, under the short-run equilibrium, the society still can, if it so desires, make adjustment and change its money holdings (or in general its financial assets) to the desired rate via adjusting the society's spending behavior on goods and services. When a stock disequilibrium occurs, a process of adjustment will develop in the flow demand for and flow supply of money through changes in expenditures on goods and services by the society. See M. Guitan, (1973), p. 785.

[17]However, this does not mean that all causes of BOP disequilibrium are purely monetary in nature, since the shocks of non-monetary nature, such as the disturbances caused by the imposition of import tariff can

result in BOP imbalances. Nevertheless, in so doing, the disturbance must cause a disparity in the money market [A. Robin, (1979) p. 1234].

[18]Under the flexible exchange rates regime the BOP = 0. Hence, any excess demand for money will cause deterioration in the exchange rate, whereas, any excess supply of money leads to appreciate the exchange rate. Thus, changes in the exchange rate restore the equilibrium in the money market. For more comprehensive treatment to the monetary approach to exchange rates determination, see the work edited by Frenkel and Johnson (1976) and work edited by B. Putnam and D. S. Wilford (1978).

[19]The market is assumed to clear such that ex-post the actual stock of nominal money equals the demand for nominal money balances. However, ex-ante the stock of money can differ from its demand, which indicates that the adjustment process through the flow variables will set in motion and works automatically to correct any disturbance, so that the market ultimately clears.

[20]The type of interest rate used to measure the opportunity cost of holding money balances variable differs according to the demand for money theory used. The transaction theories view money as inventory held for transaction purposes, therefore, they use the yields on short-term market securities, i.e. Treasury Bills, or commercial papers. The portfolio assets theories which view money as an asset, that is an alternative way to hold wealth, use the yields on long-run financial assets or even equities on real assets as the proper measure to reflect the opportunity cost to hold inactive money balances. See Judd and Scadding, (1982), pp. 994-95.

[21]The concept of reserve money has a long history in monetary analysis. Irving Fisher (1896) called it simply "money"; James Tobin (1960) called it the "demand debt of the government"; Milton Friedman and Anna Schwartz (1963) called it "high-powered money"; Karl Brunner and Allen Meltzer (1968) called it the "monetary base"; and the IMF statistics uses the term "reserve money". In this work the last three terms will be used interchangeably.

[22]The AOL is comprised of Treasury and public deposits at the Central bank plus other liabilities which include the capital of the

bank. The AOA is comprised of all government and private sector bonds, loans and assets of the central bank other than the international reserves, R. The item R, includes the monetary gold and foreign exchange holdings of the central bank. The monetary base, H, is made up of the assets of the financial sector which are supplied by the central bank and the treasury. See D. S. Wilford (1977), p. 73-78 and W. T. Wilford (1978), p. 99.

[23]Under a fixed exchange rate system, the monetary authorities stand ready to sell and buy domestic-based money for foreign exchange. However, in the long-run the monetary authorities are assumed unable to neutralize the effect of international reserve flows by making reverse movements in their holdings of domestic assets. This fact indicates that the overall BOP imbalances, surplus or deficit, cannot be totally sterilized, and they will have their influence on the domestic money supply. See Herring and Marston, (1977), p. 333.

[24]Since $\Delta DC = dDC/dt = G - T - B$, then to obtain the level of domestic credit, D, one needs to integrate D with respect to time over the interval t = 0 and t = N:

$$DC = \int_0^N G\,dt - \int_0^N T\,dt - \int_0^N B\,dt$$

[25]In empirical researches the money multiplier may be treated in one of two ways:

a) It may be considered as a constant parameter, which relates the money supply to the monetary base; i.e. $m = M/H = M/(R+H)$. See McNown and Wallace (1977). But, this simple treatment of this important variable limits the policy options of monetary control available to the monetary authorities.

b) Under the fractional reserve system, banks are required by law to hold reserves: (i) required reserve ratio which is decided by legislation and enforced by the central bank is called legal reserves, r^{ℓ}; and (ii) an excess reserves which depends the portfolio selection of the banking sector is called the excess reserve ratio, r^{e}. The public influence, which reflects individuals' desire to allocate the money balances between cash and bank deposits is measured

by the currency/reserve ratio, (c). The determinants of the money multiplier are all the above three influences. The total influence of the money multiplier, m, when decomposed into its separate influences is given as follows:

$$\text{money multiplier} = m = \frac{1 + c}{r^{\ell} + r^{e} + c}$$

where c is a variable under the influence of the general public, r^e is determined by the banking sector, and r^{ℓ} is a monetary policy variable. See D. S. Wilford, (1977), pp. 20-21, Khatkhate, (1974), pp. 742-746 and R. Shone (1984), p. 97.

[26]In any economic system, the long run state is characterized by full stock equilibrium, i.e. a situation in which the actual or existing asset stocks adjust equal the desired asset stocks. See Humphrey and Keleher, (1983), p. 225.

[27]The money multiplier is treated as an exogenous independent variable even though it is not independently estimated. However, in the model individuals and financial institutions do not necessarily behave passively by taking all the explanatory variables as given, since they are capable of influencing the rate of change of the money multiplier. See Aghevli and Khan, (1976), p. 280, and endnote No. 26 in this chapter.

[28]The money multiplier in note No. 25 can be written as: $m = (1 + c)/(r + c)$, where $r = r^{\ell} + r^{e}$. Then taking growth rates of the money multiplier we obtain an expression which presents the break down of the growth rates of this variable as follows:

$$g_m = g_c\left(\frac{cr - c}{c^2 + cr + c + r}\right) - g_r\left(\frac{r}{r + c}\right) = g_c \cdot k_1 - g_r \cdot k_2 \qquad \text{I}$$

And using the alternative definition of domestic credit as presented by equation (3.15), where: $\Delta DC = (G - T - B)$, and taking the rates of change we obtain an expression which represents the expanded relationship of the rate of change of the domestic credit variable as follows:

$$(\frac{DC}{H})g_{DC} = (\frac{DC}{H})\cdot\frac{\Delta DC}{DC} = (\frac{DC}{H})(\frac{G - T - B}{DC}) = (\frac{1}{H})(G - T - B) \qquad II$$

Substituting expressions I and II above, for g_m and $(DC/H)g_{DC}$ in the reserve flow model, we arrive at the estimation form of the BOP equation. For example, using the indirect method given by model equation (3.25), the alternative BOP estimation equation is presented as follows:

$$(\frac{R}{H})g_R = \lambda_1(g_{\hat{m}_d} + g_P) - \lambda_2(k_1\cdot g_c) + \lambda_3(k_2\cdot g_r) - \lambda_4(\frac{G}{H}) + \lambda_5(\frac{T}{H}) + \lambda_6(\frac{B}{H}) \qquad (3.25.1)$$

The expected signs of the coefficients are: $\lambda_1 > 0$, $\lambda_2 < 0$, $\lambda_3 > 0$, $\lambda_4 < 0$, $\lambda_5 > 0$, $\lambda_6 > 0$. However, nothing is priory known about the values of these coefficients. See D. S. Wilford, (1977), pp. 50-56.

[29]This excludes the disaster situations, like the 1930's world depression, where the volatile movements were very severe and all world currencies were overvalued [H. Johnson, (1977C), p. 227].

CHAPTER IV

THE EMPIRICAL ESTIMATION OF THE MABOP FOR LIBYA, KUWAIT AND SAUDI ARABIA

Introduction

The monetary approach, presented in the previous chapter, focuses on the overall BOP by centering its analysis on the monetary sector of the economy. The approach defines the BOP as the net flows (in or out) of international reserves which reflect a disequilibrium in the money market [Genberg (1974)]. Thus, the monetary approach views the changes in international reserves as representing an adjustment process which will be triggered to work automatically to correct the imbalance in the domestic money market(1) [Frenkel and Johnson (1976)]. To be able to restore equilibrium the monetary authorities manipulate the domestic component of the monetary base in an effort to eliminate the imbalance in the BOP, i.e. the change in net foreign assets. For example, a sufficient increase in domestic credits to meet an increase in demand for money may lead to elimination of a surplus in the BOP and vice versa.

In developing economies, the domestic productive base is insufficient to produce enough domestic production to satisfy the increased demand which results for an expansionary monetary policy, i.e. increasing domestic credits. Their economic plans are designed to

stimulate the employment of the idle resources, increase capital accumulation, and expand the domestic production base to satisfy domestic aggregate demand. However, in the early stages of development, domestic production always falls short of satisfying the domestic demand. Therefore, when the monetary authorities follow expansionary credit policies, such policies in many cases may lead to an increase the domestic price level, i.e. higher inflation, unless the excess credits are directed toward increasing the demand for foreign goods [Shin (1977)].

As the process of development continues, imports of capital goods in particular will grow and may use all foreign assets at the disposal of the economy. As economic development proceeds, the inflow of capital tends to increase income which induces a higher demand for money via the transaction motives. Unless the monetary authorities practice a flexible credit policy, so that the increased demand for money will be satisfied through domestic sources, the excess demand for money would be met by external sources. So if the monetary authorities practice a credit policy which is independent of the changes in the demand for money, in the absence of well developed financial markets, the excess demand for money will be met by adjustment in the trade account in a manner that exports will grow faster than imports in order to reduce deficits or create surpluses in the overall BOP. In fact, the argument behind treating the foreign assets as a source which exerts its influence on the base money and the money supply follows from the following: A deficit in the current account which is not covered by inflow of long-term capital represents an excess supply of money due to an expansionary domestic credit policies. On the other hand, a BOP

surplus reflects an excess demand for money which is not met by domestic sources.

In the case of our countries, Libya, Kuwait and Saudi Arabia, the expansion of exports - more than 99 percent oil exports - led to huge accumulation of foreign asset holdings of the monetary authorities. Hence, given the limited role of the capital accounts of these economies, and the rudimentary stage of their financial markets, such structure is reflected in overall BOP surpluses which characterized most of the entire period of study (1970-1982). This chapter will use a simple monetary model like the one which has been presented in the Chapter III and data from Libya, Kuwait and Saudi Arabia to test the MABOP theory. The empirical results will be used to predict the relationship between the net flow of foreign reserves and the domestic monetary variable, DC, in these oil-exporting small open economies. The empirical analysis will be done in two major steps. The first step involves the estimation of the reserve flow equation under the assumption of exogeneity of the domestic credits variable. In the second step, the exogeneity assumption is removed and the monetary variable is considered endogenous to the model. This estimation requires the specification of a reaction function that reflects the behavior of the monetary authorities. The later estimation is to be presented by a two-equation model consisting of the BOP and the reaction function. Then the model is simultaneously estimated using the two stage least squares (2SLS) estimation technique.

The Empirical Testing of the BOP Single Equation Model

The general view concerning the empirical estimation of the monetary approach treats the domestic credit creation of the central bank as an exogenous policy variable. The monetary authorities manipulate the domestic monetary variable in an effort to influence society's portfolio balance between holding foreign and domestic assets. The reaction of society to the monetary authorities policy decision tends to produce a change in the BOP. The estimation form of the basic reserve flow equations (3.24) and (3.25) of Chapter III are reproduced and given below:

$$(\frac{R}{H})g_R = \alpha_1 g_p + \alpha_2 g_y + \alpha_3 g_i + \alpha_4 g_m + \alpha_5 (\frac{DC}{R}) g_{DC} \quad . \qquad (4.1)$$

$$(\frac{R}{H})g_R = \beta_1 (g_{\hat{m}_d} + g_p) + \beta_2 g_m + \beta_3 (\frac{DC}{H}) g_{DC} \quad . \qquad (4.2)$$

These are the two BOP equations to be tested, and each equation summarizes the general assumptions of the MABOP theory. Equation (4.1) tests the model directly, while equation (4.2) utilizes a measure of an excess demand for money to test the model indirectly. At this stage, some essential points need to be emphasized, which are as follows:

a) The dependent variable in both equations is the BOP which includes, by definition, the "below the line" changes in net foreign assets of the banking system, NFA, weighted by the share of the foreign component to the base money, R/H. It assumes that the direction of causation runs from domestic credits, g_{DC}, to the BOP, g_R, and not the reverse.

b) The BOP as presented in the above equations is derived from the

definition of the money supply, which equals the product of the money multiplier and the monetary base. However, the BOP as an adjustment function is derived from the flow equilibrium condition in the money market.

c) When the relationship is given by equation (4.2), the real demand for money is assumed to be independently specified and estimated, i.e. $m^d = f(y,c) + e$. This relies on the monetariests' key assumption of the existence of a well-behaved, stable demand for money function which is estimated independently of the money supply process. This implies that changes in domestic credits will not affect the specification of the demand function. The demand for money exerts its influence on the BOP via its own determinants, the real income and the opportunity cost variables. Therefore, a correct specification of the demand for money function is considered of crucial importance as far as the empirical estimation of the BOP is concerned.

d) The money multiplier is treated as independent variable in the BOP equation, although it is not independently estimated.

e) The central policy variable is the rate of change in the domestic credits variable. The negative relationship between the BOP (growth in net foreign assets) and the domestic credits component of the monetary base may be totally or partially explained by sterilization policies which the central bank practices. Hence, the behavior of the monetary authorities will be explained in the second step estimation via its reaction function.

f) The two equations (4.1) and (4.2) are derived under the long-run assumption where the economy is at full employment and prices and exchange rate are assumed fixed. The PPP is assumed to hold, hence, the

domestic price level is proportional to the world price level ($P = \bar{E} \cdot P_w$). In terms of growth rates $g_P = g_{\bar{E}} + g_{P_w}$, and under fixed rates $g_{\bar{E}} = 0$, so $g_P = g_{P_w}$.

With such necessary key points clarified, we can start the empirical testing of the standard monetary approach model via equations (4.1) and (4.2). The estimation of the model as presented by the first equation will be referred to as the "Direct Estimation" of the BOP equation. An alternative test of the theory is obtained by regressing the BOP on a measure of the excess demand for money as presented by equation (4.2). This second set of testing will be referred to as the "Indirect Estimation" of the BOP equation.

The Direct Estimation of the BOP

Here, we are going to discuss some of the empirical findings regarding the relative impact of domestic supply of and demand for money variables on the BOP, which is done by estimating the simple monetary model of equation (4.1). The test uses quarterly data from Libya: 1970-QII-1979-QIV, Kuwait: 1973-QI-1982-QIV, and Saudi Arabia: 1970-QII-1982-QIV. The model explains the BOP adjustments under the essential assumption of the exogeneity of the central bank's domestic credit variable, or in brief, the exogeneity of the monetary variable. The model follows the small open economy hypothesis, where the exchange rate is assumed fixed, at least during the relevant period of study. All variables are considered exogenously determined either by the trend of the corresponding variable, by the ROW, or by the monetary authorities. The domestic credit variable is a policy instrument which is used by the monetary authorities to influence the portfolio balances

of the general public between holding foreign assets and domestic assets. The public's reaction to the monetary authorities' policy decisions will lead to a change in net foreign assets (BOP by definition). Adding an error term to the BOP equation (4.1), we obtain the equation to be estimated as follows:

$$kg_R = \alpha_1 g_P + \alpha_2 g_y + \alpha_3 g_{\pi e} + \alpha_4 g_m + \alpha_5 (1 - k) g_{DC} + \mu \ . \qquad (4.3)$$

$$\alpha_1, \ \alpha_2 > 0, \qquad \alpha_3, \ \alpha_4 \text{ and } \alpha_5 < 0$$

All variables in equation (4.3) are as defined above, except μ which is an error term, and the weights (R/H) and (DC/H) are replaced by the terms k and (1 - k), respectively, for convenience. This BOP equation is also known as the "basic reserve flow equation".

The monetary model leads us to expect the price coefficient, α_1, to be +1.0[3]; however, at least carrying a positive sign is considered of prime importance. The relation indicates that an increase in the price variable tends to reduce the real value of cash balance holdings by the public. Similarly an increase in income tends to increase the demand for money. Thus, both income and price increases tend to induce a foreign reserves inflow.

The opportunity cost of holding idle money balances, as approximated by the expected inflation, is inversely related to the demand for money. Hence, the coefficient of expected inflation is expected to carry a negative sign. The crucial assumption of the monetary approach is the negative relation between the reserve flows and the domestic money supply or the monetary variable. The net domestic credits and the money multiplier are treated as exogenous variables, and

each coefficient is expected to be equal -1.0. But of more importance is the expected negative signs of $\hat{\alpha}_4$ and $\hat{\alpha}_5$. Each is quantitatively equal to unity and qualitatively is negative [Kreinin and Officer (1978)].

The empirical estimations have been done using quarterly data but with different time periods due to the availability of the data. The results of the estimation are presented in Table III. In order to determine the statistical significance for each individual coefficient a one-tail t-test is performed on each coefficient estimate. A main concern is placed on the sign of the coefficient. The size of the coefficient, though essential, is considered of secondary importance compared to its qualitative value.

As shown in Table III, the regression results obtained for the case countries are good in general. The high coefficients of determination, R_s^2, and the significant F-statistics indicate the goodness of fit in these regressions. But not all independent variables are statistically significant at the 5 percent level of significance. In all cases, the estimates of income elasticities are quite low and not significantly different from zero at the 5 percent significance level. Almost all coefficients of the expected inflation carry the predicted negative signs, but they are not statistically significant. The exception is the Libyan case, where this coefficient is significant at the 5 percent level in the regression using M1, but has a low significance level of 10 percent in the regression using M2.

The estimates of the coefficients of the money multiplier, in all cases, carry their expected signs and are all significant at the 5 percent level. The only exception is the Libyan regression, which uses

TABLE III

ESTIMATES OF THE BOP EQUATION (4.3) USING DIRECT ESTIMATION AND OLS

variables / money	α_1	α_2	α_3	α_4	α_5	$\bar{R}^2$	DW	rho	F	RMSE
Libya, 1970QIII - 1979QIV:										
M1	0.887	0.374	-0.016	-1.161	-0.673	0.61	1.899	--	15	0.162
	(2.087)	(1.172)	(1.734)	(1.557)	(6.171)					
M2	0.960	0.208	-0.014	-0.921	-0.717	0.63	1.889	--	16	0.159
	(2.283)	(0.681)	(1.629)	(1.938)	(7.078)					
Kuwait, 1973QI - 1982QIV:										
M1	0.912	-0.212	-0.012	-0.824	-1.023	0.91	2.000	--	97	0.103
	(1.867)	(1.398)	(0.508)	(9.668)	(21.270)					
M2	0.769	-0.969	-0.004	-0.939	-1.060	0.96	1.980	--	240	0.067
	(2.417)	(0.695)	(0.267)	(16.334)	(33.432)					
Saudi Arabia, 197QII - 1982Q4:										
M1	0.909	0.088	-0.0008	-0.844	-0.976	0.99	1.568	0.216	--	0.009
	(2.633)	(1.260)	(0.604)	(3.631)	(76.900)					
M2	0.668	0.082	-0.0002	-0.992	-0.981	0.99	1.177	0.412	--	0.005
	(2.637)	(1.591)	(0.202)	(7.255)	(88.082)					

TABLE III (Continued)

Notes:

(1) The dependent variable is the rate of change of net foreign reserves holdings of the central bank, kg_R, weighted by the share of the foreign component in base money kg_R where $k = (R/H)$.

(2) α_1 is the coefficient of the rate of change of the general price level, g_P. P is measured by the consumer price index (CPI), 1975 = 100 for each country. However, in Libya CPI is replaced by the GDP price deflator, 1975 = 100.

(3) α_2 is the coefficient of the rate of change of real income, g_y. y is real GDP in 1975 prices.

(4) α_3 is the rate of change of the expected inflation, $g_{\pi e}$.

(5) α_4 is the coefficient of the rate of change of the money multiplier, g_m, where $m = M^S/H$.

(6) α_5 is the coefficient of the rate of change of net domestic credits of the central bank in each country, g_{DC}, weighted by the share of this domestic component of the base money, $(1 - k) = (DC/H)$.

(7) M1 and M2 are the narrow and wide definitions of money used in the regression, respectively.

(8) Figures in parentheses are t-statistics.

(9) $\bar{R}^2$ is the R^2 adjusted for the degrees of freedom:

$$\bar{R}^2 = 1 - [(1 - R^2)(N - 1)/(N - K)]$$

where N = the number of observations, and
K = the number of explanatory variables.

(10) rho is the estimate of the coefficient of the first order auto correlation. In this table both regressions in the Saudi case were corrected for serial correlation using the Cochrane-Orcutt technique.

(11) RMSE is the root mean squares errors.

the M1 definition of money, where the estimate of the coefficient of the M1 multiplier has the right sign but, it turns out to be statistically insignificant.

All estimates of the coefficients of the domestic money supply variable, that is the domestic credits creation variable carry the expected sign and are statistically significant at the 5 percent level. However, for some regressions, even though the estimates of the domestic monetary variable carry the expected sign and are significant at the 5 percent level, they fail to support the monetary approach assertion that the net domestic credits coefficient is equal to -1.0. Only the Kuwaiti results confirm that assumption.(4)

For the Libyan regressions using both M1 and M2 and the Saudi regressions using M1, the net domestic credits carried the right sign and are significant at the 5 percent, even at 1 percent level. However, the calculated t-ratios for the Libyan and Saudi regressions using both definitions of money reported estimates of the coefficient of net domestic credits variable which are statistically different from -1.0. Hence, these results failed to confirm the main assumption of the MABOP. On the other hand, the two regressions for Kuwait using M1 and M2 reported that the estimated coefficients for the net domestic credits variable not only are carrying the expected signs, but also are statistically significant at the 1 percent level. These findings do conform the assertion of the monetary approach that $\hat{\alpha}_5 = -1.0$.

The qualitative signs are of great importance, and all estimated coefficients carry their predicted signs,(5) with the exception of the coefficients of income in Kuwait in both regressions. However, not much weight should be attached to the real income result since the

quantitative magnitude is very low and statistically insignificant in both regressions. In the other two cases the estimated coefficients of the real income variable do carry the expected positive sign, but are statistically insignificant also. The obtained result is an indication of the low role both real income and expected inflation play in the overall determination of the model. In fact, given the political, social and economic structural setting in these Muslim, oil-rich developing countries, there is great doubt as to the significance of the role that the interest rate or its proxy, the expected rate of inflation, can play. As for the income variable, in such economies the degree of monetization is still relatively low; hence, a relatively low income elasticity with respect to the reserve flow (BOP) is expected, and the results we obtained from our empirical results may be considered as clear evidence.

Since the model is estimated using time series data, it is of particular importance to check for the presence of the first-order autocorrelation. The Durbin-Watson statistics (except in Saudi Arabia) indicate the absence of serial correlation among the residuals. However, when the preliminary estimates reveal evidence of first-order autocorrelation, as in Saudi Arabia, the iterative Cochrane-Orcutt Procedure is applied to correct for that problem. The overall fit of the BOP equation is good with the independent variables jointly explaining a large proportion (as high as 99 percent in Arabia and as low as 61 percent in Libya) of the variation in the dependent variable. All regressions have highly significant F statistics and fairly low standard errors. Moreover, the equations should perform a good historical simulation as indicated by the fairly low values of the

root-mean-squares-error, for all regressions. However, only the Kuwaiti results for both regressions support the MABOP's key contention of $\alpha_5 = -1.0$.

The Indirect Estimation of the BOP

The indirect estimation of the BOP is carried out in two steps. The first deals with the specification of the real demand for money function and the estimation of that function for each country. This step enables one to acquire a series on the predicted real demand for money, (M^d/P). For the second step, we transform the predicted demand for money series into rates of growth and substitute them into the reserve flow equation (BOP) as given by equation (4.2). After adding an error term the BOP (reserve flow) equation is estimated by the indirect estimation method as follows:

$$kg_R = \beta_1(g_{\hat{m}^d} + g_P) + \beta_2 g_m + \beta_3(1 - k)g_{DC} + V , \qquad (4.4)$$

$$\beta_1 > 0 \text{ and } \beta_2 = \beta_3 = -1.0 .$$

All variables are as defined previously, and the subscript $\hat{m}^d$ stands for the estimated real demand for money. The estimation process of equation (4.4) involves two additional major steps.

(1) The Estimation of the Demand for Money: As indicated above, the performance of this step will allow us to generate a series of values predicting the real demand for money. The existence of a well-identified demand for money function is an important aspect of the analysis of the MABOP adjustment. Following Chow (1966), a distinction

is made between long run and short run demand for money functions. This analysis is done by introducing a mechanism that allows the adjustment of the actual stock of real cash balances to its desired level. The long run demand for money function is specified as follows:

$$\left(\frac{M^d}{P}\right)_t = m_t^d = Ky_t^{\theta_1} e^{r\theta_2} \tag{4.5}$$

where y_t is a real income, r is an opportunity cost of holding idle money balances, K is a constant term, and M_t^d is the aggregate desired demand for nominal money, and t is time. For the actual estimation, a semi-logarithmic form of equation (4.5) is used to obtain the long run demand for real money is as follows:

$$\ln\left(\frac{M}{P}\right)^d = K + \theta_1 \ln y_t + \theta_2 r_t \ . \tag{4.6}$$

To arrive at the short run demand function, it is assumed that society adjusts its desired money holdings to their actual level according to a partial adjustment procedure. This means that in the short run in which estimation is based (year or quarter) society is assumed to always adjust the actual money stock to its desired level as a fraction (λ) of the gap between the desired level in the current period (year or quarter) and the actual level in the previous period.(6) The substitution of the adjustment process into the long run equation (4.6) will yield the short run demand equation to be used in empirical estimation of the real demand for money as given below:

$$\ln(M/P)^d_t = \lambda\theta_0 + \lambda\theta_1 \ln y_t + \lambda\theta_2 \ln r + (1 - \lambda)\ln(M/P)^d_t + \mu \,, \qquad (4.7)$$

$$\lambda\theta_1 > 0, \; \lambda\theta_2 < 0 \,.$$

The term μ is an error term, assumed normally distributed with zero mean and constant variance. The values of $\lambda\theta_1$ and $\lambda\theta_2$ are the short run coefficients of income and interest rate. Since both enter in logarithmic form, they are the short run income and interest elasticities of demand for money [Wong (1977) and A. Darrat (1984)]. But, given the institutional and social structure of our sample countries, we are unable to use interest rates as a measure of the opportunity cost for holding idle money balances.

In developing economies durable goods are one form of holding wealth besides the existing array of financial assets which are available to the individuals. Therefore, it is appropriate to add the implicit return on goods, that is the rate of inflation, in addition to the market rate of interest as separate influence. Thus the two variables represent the opportunity cost arguments in the demand for money function. In Libya, Kuwait and Saudi Arabia interest rate payments are condemned by religious codes and the general public believes interest payment is a type of usury. Moreover, the governments' policies fix the official market interest rates at very low rates. Hence, the market interest rates in these economies do not reflect the conditions that exist in their money markets.(7) The socio-economic structure in these economies is considered a major constraint that limits the choice of wealth holding available to individual investors. Durable goods emerge as the major alternative to money holding, and their expected rate of return should be included as a

separate influence in the money demand function.

Following, Laidler (1977) and Dornbusch and Fisher (1981), the demand for money function should include the expected rate of inflation as a separate influence in that function.(8) However, since the interest rates are fixed by institutional decision in the case of Libya and Kuwait and banned in Saudi Arabia, the implicit return on goods, as approximated by the expected rate of inflation, is left as the only measure for the opportunity cost of holding inactive money balances. Therefore, in our empirical estimation of the demand for money function, the expected rate of inflation will be the only proxy for the opportunity cost variable. Hence, equation (4.7) will be rewritten as follows:(9)

$$\ln(M/P)_t^d = C_0 + C_1 \ln y_t + C_2 \pi^e + C_3 \ln(M/P)_{t-1} + V \ , \qquad (4.8)$$

$$C_0 = \lambda\theta_0,\ C_1 = \lambda\theta_1,\ C_2 = \lambda\theta_2 \text{ and } C_3 = (1 - \lambda) \ .$$

Equation (4.8) is the short run demand for money equation which is used here for the empirical estimation. The estimates of equation (4.8) for the three countries are given in Table IV. The coefficients of determination, R^2, are quite high and F statistics are statistically significant in all cases. Most of the estimates of the coefficients have the correct signs, and are significant at the 5 percent level. The exception is the opportunity cost variable where the coefficient of expected inflation is insignificant in all cases and has the wrong sign for the Saudi cases.(10) The income elasticities in all countries are statistically significant at the 5 percent level and have larger magnitude with M1 in Kuwait and Saudi Arabia, whereas in Libya, the wide

TABLE IV

THE ESTIMATED DEMAND FOR REAL MONEY, USING EQUATION (4.8) BY OLS

money definition	C_0	C_1	C_2	C_3	$\bar{R}^2$	h	rho	RMSE
Libya, 1970QII - 1979QIV:								
M1	-0.394	0.385	-0.299	0.720	0.98	1.117	-0.134	0.068
	(-1.70)	(2.91)	(-1.35)	(7.05)				
M2	-.443	0.537	-.168	0.612	0.99	0.225	-0.040	0.055
	(-2.15)	(3.42)	(-0.93)	(5.37)				
Kuwait, 1972QIV - 1982QIV:								
M1	-0.774	0.402	-0.335	0.747	0.95	2.169	0.322	0.110
	(-1.66)	(2.16)	(0.20)	(6.22)				
M2	-0.572	0.302	-0.017	0.840	0.98	1.746	0.246	0.057
	(-2.79)	(3.04)	(0.02)	(12.98)				
Saudi Arabia, 1970QII - 1982QIV:								
M1	-1.45	0.24	0.19	0.89	0.99	1.041	0.139	0.055
	(-3.05)	(3.41)	(1.12)	(29.70)				
M2	-1.33	0.22	0.13	0.90	0.99	0.582	0.077	0.043
	(3.55)	(3.91)	(1.03)	(36.83)				

TABLE IV (Continued)

Notes:

(1) The dependent variables are the natural logarithms of M1 and M2 which are the narrow and wide definition of real money balances respectively.

(2) M1 and M2 stands for regressions using the narrow and wide definition of money respectively.

(3) Figures in parentheses are t-values.

(4) $\bar{R}^2$ is the adjusted R^2.

(5) h is the Durbin statistic for a regression which includes a lagged endogenouse variable. i.e. log m_{t-1}:

$$h = [1 - (1/5)DW][N/(1 - var(b)]^{-1/2}$$

where var(b) is the estimate of the variance of the lagged endogenous variable, N is the number of observations and DW is the Durbin-Watson statistic.

(6) rho is the estimate of the coefficient of the first order serial correlation, as obtained from the Cochran-Orcutt iteration technique.

(7) Since equation (4.8) is a short run equation for the real demand for money, the long run estimates of the coefficients of real income and expected inflation are calculated as follows:

(a) The long run income elasticities, $\delta = (\lambda\theta_1/\lambda)$. Using the Libyan estimates δ are 1.375 and 1.384 for M1 and M2 respectively.

(b) The long run estimates of coefficient of π^e, $\Phi = (\lambda\theta_2/\lambda)$. For Libya the estimates of Φ are -1.068 and -0.433 for M1 and M2 respectively.

definition of money shows a larger income elasticity as compared with M1. This indicates that in Libya a given percentage increase in real income causes individuals to increase their time and saving deposits.(11) The short-run income elasticity of real demand for money is given by the estimates of the coefficient of real income since the variable was entered logarithmically. For example, the income elasticities using M1 are 0.385, 0.402 and 0.24 for Libya, Kuwait and Saudi Arabia respectively.

Finally, based on the above findings one may conclude that the first step has been fulfilled. A demand for money function was specified, then estimated for each case country, and a predicted series of real demand for money is obtained.(12) Now, we turn to the second step and continue our estimation of equation (4.2).

(2) The Indirect Estimation of the BOP: In the first step, a series of the desired real money demand is generated from the values of the regressions in each country. The new variable we obtain is the predicted real money demand, $(\hat{M/P})^d$. After taking the rates of change of this new series to acquire a series of $g_{\hat{m}^d}$, we proceed to estimate the BOP equation. In this research two versions of the BOP equations will be estimated by indirect estimation depending on the independent variables to be included in each equation:

(i) Version one of the reserve flow equation will be referred to as MARKI. It presents the rate of change of net foreign reserves as the dependent variable. The relevant explanatory variables in this BOP equation are given by the rate of change of the desired demand for nominal money ($g_{\hat{m}^d} + g_P$) and the domestic money supply variables which are given by the rate of change of the money multiplier (g_m) and the

rate of change in the net domestic credit (g_{DC}). The MARKI BOP equation is as follows:

$$kg_R = \beta_1(g_{\hat{m}^d} + g_P) + \beta_2 g_m + \beta_3(1 - k)g_{DC} + v \ , \qquad (4.9)$$

$$\beta_1 > 0, \quad \beta_2 = \beta_3 = -1 \ .$$

(ii) Version two of the reserve flow equation will be referred to as MARKII. Here all the relevant independent variables in the BOP equation are lumped together into a single independent variable. The combined independent variable is generated by taking the difference between the rate of change of the part of the money supply under the monetary authorities' control, $[g_m + (1 - k)g_{DC}]$, and the rate of change of the desired demand for nominal money, $(g_{\hat{m}^d} + g_P)$. Since, the rate of change of two different levels of stock variables is used to denote a flow variable, we may refer to this new variable $[(1 - k)g_{DC} + g_m - g_{\hat{m}^d} - g_P]$ as the predicted ex ante excess flow supply of money (EAEFSM). The MARKII BOP equation which we are going to estimate using the indirect estimation method (IEM) is given as follows:

$$kg_R = \Phi EAEFSM + \mu, \qquad \text{where } \Phi = -1. \qquad (4.10)$$

The statistical findings from the estimation of equation (4.9) are reported in Table V. The regressions using both definitions of money performed well in general. The coefficients of determination are all high, and the F statistics are all significant. All coefficients have the expected signs. The estimates of the coefficient of the nominal demand for money variable are positive as predicted by the theory.(13)

TABLE V

ESTIMATION OF THE BOP EQUATION (4.9) INDIRECT SINGLE EQUATION, MARK I BY OLS

money definition	β_1	β_2	β_3	$\bar{R}^2$	DW	F	SER
Libya: 1970QIII - 1979QIV:							
M1	0.436 (2.299)	-0.879 (-1.217)	-0.794 (-7.434)	0.59	1.832	28	0.027
M2	0.259 (1.098)	-0.858 (-1.731)	-0.791 (-7.567)	0.57	1.807	26	0.028
Kuwait: 1973QII - 1982QIV:							
M1	0.286 (2.339)	-0.878 (10.247)	-1.028 (22.273)	0.91	2.214	205	0.010
M2	0.333 (3.102)	-0.940 (17.580)	-1.054 (35.130)	0.96	2.161	541	0.004
Saudi Arabia: 1970QIII - 1982QIV:							
M1	0.873 (6.417)	-0.922 (-4.543)	-0.969 (-103.527)	0.99	2.089	4986	0.007
M2	0.862 (6.686	-0.970 (-6.680)	-0.971 (-111.863)	0.99	1.985	6654	0.005

TABLE V (Continued)

Notes:

(1) The dependent variable $(R/H)g_R$ is the rate of change of net foreign reserves held by the central bank in Libya and Kuwait and SAMA in Saudi Arabia. It is weighted by the share of the foreign component in base money.

(2) The independent variable $(g_{\hat{m}^d} + g_p)$ is the rate of change of the nominal money demand, where $g_{\hat{m}^d}$ is the rate of change of the desired demand for real balances obtained from the predicted values of the estimated demand for money reported in Table IV. And all other variables are as given in Table V.

(3) M1 and M2 refer to the regression equations using the narrow and broad definitions of money respectively.

(4) All other notations and symbols are as given in the previous tables.

(5) The figures in parentheses are t-values.

The estimates of the coefficient of the money supply variable -- the net domestic credit -- are statistically significant at the 5 percent level and all are very close to -1.0 in magnitude. For the cases of Libya and Kuwait the coefficients are not significantly different from -1.0, for both definitions of money. However, in the case of Saudi Arabia, despite having the value of the coefficient very close to -1.0, the estimates obtained failed to support the contention of the monetary approach.(14) The results in the Libya case, in fact, are due to the large standard errors of this variable. Generally, we can conclude that the estimation of equation (4.9), with the exception of the poor results from the regressions in the Libyan case, provides good results and supports the monetary approach to the BOP, especially in Kuwait.

The statistical findings from the estimation of equation (4.10) are reported in Table VI. The results from the MARKII equation are good in general, since coefficients are significant at the 1 percent level. The empirical findings concerning the sign for the ex-ante excess flow supply of money (EAEFSM) is negative as predicted, regardless of the definition of money used. However, only in the case of Kuwait is the coefficient's magnitude statistically not different from -1.0. The results in the case of Libya and Saudi Arabia are different from -1.0. Once again the data from both countries have failed to lend support to the basic argument of the monetary approach, despite the values of the coefficients being very close to -1.0.(15)

Finally, we conclude from the empirical findings from the single equation estimations the results obtained are not very satisfactory. Despite the high $\bar{R}^2$ and significant F-statistics reported, some of the regressions do suffer from the problem of serial correlation, as in the

TABLE VI

ESTIMATION OF THE BOP EQUATION (4.10)
INDIRECT SINGLE EQUATION,
MARK II (OLS)

variables / money	ϕ	$\bar{R}^2$	DW	rho	SER
Libya: 1970QIII - 1979QIV:					
M1	-0.740 (-7.822)	0.62	1.530	0.227	0.028
M2	-0.724 (-7.303)	0.59	1.478	0.247	0.031
Kuwait: 1973QII - 1982QIV:					
M1	-0.926 (16.955)	0.95	2.181	256	0.018
M2	-0.966 (26.286)	0.93	2.142	676	0.008
Saudi Arabia: 1970QIII - 1982QIV:					
M1	-0.966 (126.695)	0.99	2.211	-0.114	0.007
M2	-0.966 (146.162)	0.99	2.144	-0.975	0.005

Notes:

(1) The dependent variable is $(R/H)g_R$ as defined in Tables III and V.

(2) The independent variable EAESFSM is what we termed as ax-ante excess flow supply of money. It equals to the difference between $[(DC/R)g_{DC} + g_m]$ which is the rate of change of the nominal money demand as defined in the text.

(3) All other notations and symbols are as defined previously.

(4) The figures in parentheses are t-values.

Saudi regression using M2 in Table III which has been corrected using the Cochrane-Orcutt technique. Moreover, the estimates of the coefficients of some variables are either statistically insignificant (as real income in reserve flow equal reported in Table III, and the expected inflation in the demand for money given in Table IV) or the estimated coefficients carried wrong signs (as in the case of real income in Kuwait, Table III, and the expected inflation in the Saudi demand for money, Table IV).

The results indicate the existence of disparity in the performance of this single equation model among our sample countries which may be attributed to the differences in their economic characteristics despite their similarity as developing small oil economies. In fact, our findings may lead us to state that using the data from these three oil-exporting small developing economies at best provides only weak support to the claim of the MABOP.(16) In our study all results point to the contention that an expansionary monetary policy (increasing the domestic money supply) tends to produce an unfavorable BOP position in that country. Evidence is backed by all the results obtained from the three countries. However, most results do not lend complete support to the one-to-one relation between the BOP (the change in net foreign assets) and change in the domestic money supply, despite the fact that the coefficients of the net domestic credits (and the money multiplier) are very close to -1.0 in almost all the regression sets. This final conclusion may call for a further investigation of the relation between the domestic money supply and the BOP, which is the subject of the next section of this chapter.

Domestic Money Supply and the BOP - A Simultaneous Equation Model

In an open economy, the money supply at a given time is the product of that economy's money multiplier and its base money, i.e., $M = m(R + DC)$. Given this definition, the money supply can be expanded by increasing the money multiplier and/or the domestic credit and/or the foreign assets component of the base, or all the above. In fact, the role played by the international reserve flows in the determination of the domestic money supply is what distinguishes the monetary sector in an open economy from that of a closed one. In an open economy the monetary authority needs to incorporate its foreign asset holdings in its monetary framework with those involving domestic assets in order for that country to be able to use monetary policy to achieve the public economic goals [Phaup-Kusinintz (1975)]. However, in a small open economy under fixed exchange rates, the monetary authority's control over its monetary base is limited to the base's domestic source, that is domestic credits. But changes in net domestic credits can be offset by changes in the net foreign assets which result from the process of reaction of the private sector. Thus, the actions of individuals impose limits on the ability of the monetary authority's control over the total money supply.(17)

As indicated above, the main argument of the standard monetary approach is its assumption of a complete offsetting relation between the domestic and foreign components of the base money. This means the coefficient of the rate of change in net domestic credits in the reserve flow equation is expected to be -1.0. This explains the treatment of the net domestic credits, in the previous empirical testing, as an

exogenously determined variable. Thus, according to the standard monetary approach, a monetary policy via changes in domestic credits is deemed useless in controlling the total money supply. Any efforts by the monetary authorities to change the money stock will trigger a reaction by the public to offset that policy as long as the actual money stock differs from what the society desires to hold. The standard monetary approach, as explained above, considers the domestic credits to be an instrument of monetary policy. Therefore, the policy target, according to the monetary approach, is not the control of the base money, or the money supply, but the control over the base's composition between domestic and foreign assets [Wilford and Wilford (1978)].

However, in the small open economy case, to maintain the fixed exchange rate the monetary authorities are required to intervene in the foreign exchange markets by selling and buying foreign exchange. Such actions, no doubt, exert their effect on the foreign component of the monetary base and, hence, the money supply via the money multiplier. The above analysis shows how the two components of base money relate to one another. Therefore, it is in the assumption of such interdependence that the impact of money supply factors on the reserve flow (BOP) equation should be studied.

The Domestic Credits and the BOP

The estimates of the reserve flow (BOP) equations demonstrated the negative correlation between the rate of change of the net domestic credits and the rate of change of the net foreign assets. However, in Saudi Arabia and Libya the assumed correlation is low and not as postulated by the standard monetary approach to the BOP, i.e. the values

of the coefficient of the domestic credit variable in Libya and Saudi Arabia failed to support the basic assumption of the monetary approach since the estimates of the coefficient of g_{DC} were statistically different from -1.0. The question then, is: does this result from a discretionary policy or does it indicate the presence of a sterilization policy?(18) The answer to such questions relates to the problem of simultaneous bias in single equation estimation [A. Koutsoyiannis (1977)].

It is possible that we cannot treat domestic credits as an exogenous policy variable independent of the net foreign reserves variable as assumed by equations (4.1) and (4.2). This means, that it is necessary to consider the possibility of the reverse causation; i.e., the feedback effect of the changes in foreign reserves on domestic credits. In that case, the domestic credit would be treated as an endogenous variable to be determined by the model. To take up such a task, several techniques are available which may be used to check the direction of causality and to account for the feedback effect [Sims (1972), Granger (1978) and Blejer (1979)].

There are several techniques used in testing for causality. Some techniques, as the one used by Sims (1972) and Granger (1978) are not suitable for short time series as our data. However, there are techniques that suit the short time series but require the availability of monthly data. Thus, in all cases our data are not sufficient to meet these requirements. The technique which is more suitable to our case does not involve a test for the direction of causality, despite the possible existence of reverse causation or a feedback effect from the dependent variable to the independent ones. Instead, a simultaneous

equation system can be used to introduce a reaction function that expresses the behavior of the monetary authority. In the following analysis the endogeniety of the domestic credits variable is considered. The task has been done by the introduction of a simple simultaneous equation model to analyze the BOP adjustment process in which the domestic credit variable is treated as an endogenous variable.

The Reaction Function of the Monetary Authorities

In a small open economy under a fixed exchange regime, a reaction function in the context of a monetary policy needs to show the measures that the monetary authorities can take in any effort to exert some control over the domestic money supply. In essence, the reaction function demonstrates the use of foreign reserves to influence the monetary base. This study attempts to investigate the degree to which payment imbalances influence the ability of the monetary authorities to control the money supply. The capability of the monetary authorities to sterilize the impact of the foreign reserves flows (in or out) on the monetary base and the total money supply will be expressed.

As explained above, the monetary base reflects the changes on the assets side of the balance sheet of the central bank. The monetary base is determined by demand and supply forces as presented by the demand pressures for the base and the behavior of the central bank to accommodate those pressures and supply the desired high-powered money. S. M. Lee (1985) stated that the accommodation pressures mostly come from the government (fiscal) and foreign sectors. Meanwhile, the supply of the high-powered money depends on the reaction of the monetary authorities to meet such pressures. The behavior of the monetary

authorities can be captured by a reaction function that contains those variables which influence the course of monetary policy. Therefore, the specification of the reaction function of the monetary authorities includes objective variables which reflects the state of the economy as presented by macroeconomic stabilization policies and the sources of pressure for monetary accommodations. In empirical studies a great emphasis is put on the correct specification of the reaction function which accurately describes the behavior of the monetary authorities.(19)

In the case of Libya, Kuwait and Saudi Arabia, it seems reasonable to assume that the monetary authorities in the conduct of their credit policies are concerned with the following objectives: (a) These monetary authorities control the money supplies to pursue price stability and other domestic goals. And to be able to control the base money they must offset movements in its uncontrolled component through changes in the controlled one. This implies that each monetary authority neutralizes the impact of foreign reserves on the monetary base, hence, sterilization is assumed to be practiced. (b) These monetary authorities do emphasize the goals of economic development of achieving more production and high economic growth with price stability when their credit policies are formulated. Thus, each monetary authority takes into account the government's overall budget when accommodating the demand pressures and supply the desired credit.

All the above factors are considered when one constructs a reaction function to explain the behavior of the monetary authorities. Following Ujiie (1975), Genberg (1976), Tullio (1976) and Lee (1985), the basic reaction function used in this study specifies the rate of change in net domestic credit creation of the central bank (the rate of growth of the

domestic component of the base money)[20] as a function of the rates of change of the BOP, real income, government budget and the domestic price level. Each independent variable selected is frequently offered as a major cause of change in domestic credit and is assumed to exert a strong explanatory power on the dependent variable. In other words, these variables are claimed to be possible determinants of each central bank's behavior.[21] The functional form chosen to represent the reaction function of the monetary authorities of these oil-based small open economies is as follows:

$$g_{DC} = h(g_R, g_p, g_y, g_{BD}) \ . \qquad (4.11)$$

Equation (4.11) expresses the growth rate of net domestic credits creation of the central bank (g_{DC}) as a function of the growth rates of net foreign reserves holdings of the central bank (g_R), real income (g_y), inflation (g_π) and government budget deficit or some other measure of fiscal policy (g_{BD}). All variables are measured in growth rates. The monetary authorities are assumed to tighten domestic credit in response to a higher inflation. Therefore the sign of the coefficient of inflation is expected to be negative [J. Tullio (1978) and R. K. Abrams (1979)]. The expected sign of the coefficient of growth in real income is positive on the grounds that the monetary authorities provide more domestic credits to satisfy the public's higher transaction demand for money which results from an increase in real income [Lee (1985)]. In LDCs the ability of the government to finance its budget by borrowing from the public is absent since financial markets are in relatively early stages of development, therefore, borrowing from the central bank and money creation are heavily practiced. Moreover, the central banks'

monetary decision is not separated from the Treasury's decision concerning the general financial stabilization program. In other words the monetary authorities are dominated by the Treasury. Thus, the change in the government budget variable is included to capture the reaction of the central bank to the accommodation pressures from the fiscal sector. The fiscal measure proposed is either Barro's expenditure variable, (Barro 1977), measured by government expenditures relative to normal, or the government budget deficit if available. This variable is used to capture the relation between budget changes and the base money. The fiscal variable is generally expected to carry a positive sign, reflecting the impact of the expansionary fiscal policy on the base money or the money supply. This variable will be used whenever the data on budget deficits are either not available or if found that the series is incomplete. Since the change in net domestic credit is used to offset the development in the BOP, it is postulated to offset the change in the accumulation of foreign reserves. Thus, the coefficient of the rate of change in net foreign assets is expected to carry a negative sign. The general form of the reaction function to be estimated is:

$$(1 - k)g_{DC} = \theta_0 + \theta_1 g_{\pi} + \theta_2 g_y + \theta_3 g_{BD} + \theta_4 k g_R + \varepsilon \ . \qquad (4.12)$$

In equation (4.12) the dependent variable is the rate of change in net domestic credit creation of the central bank (the credit policy variable) weighted by the domestic component's share in base money as has been done in the BOP equation. The rate of change of the net foreign reserve variable (BOP) is also weighted by its share in the base [$k = (R/H)$]; ε is a stochastic error term, and other variables are as

defined above.

The Empirical Estimation of the System

The behavior of the monetary authorities in formulating their credit policy is described by the reaction function as specified above. The BOP equations are given by equation (4.3) or (4.4). Now, the equation which presents the monetary authorities' reaction function is combined with either of the BOP equations, and, both equations are treated as a system.(22) The system is used in the simultaneous estimation of the credit policy variable, g_{DC}, and the balance of payments, g_R. The system of equations is given as follows:

$$kg_R = \alpha_1 g_P + \alpha_2 g_y + \alpha_3 g_{\pi e} + \alpha_4 g_m + \alpha_5(1 - k)g_{DC} + u \ . \qquad (4.13)$$

$$(1 - k)g_{DC} = \theta_0 + \theta_1 g_{\pi} + \theta_2 g_{ye} + \theta_3 g_{BD} + \theta_4 k \cdot g_R + e \ . \qquad (4.14)$$

However, if the BOP is indirectly estimated, then equation (4.13) will be replaced by the following equation:

$$k \cdot g_R = \beta_1(g_{\hat{m}d} + g_P) + \beta_2 g_m + \beta_3(1 - k)g_{DC} + V \ . \qquad (4.15)$$

The simultaneous equations system as expressed in equations (4.13) or (4.15) combined with (4.14) has two endogenous variables, the BOP and the domestic credit. The credit variable is now determined by the whole system, where, the determinants of the domestic money variable are the right hand terms of its equation plus all the variables in the BOP equation. In fact, the simultaneous estimation of this system will serve: (i) to investigate the possibility of sterilization policy practiced by the central bank; and (ii) to account for the feedback effect between the net domestic credit and the BOP, since the central

bank includes changes in foreign reserves in formulating its credit policy. The empirical estimation of this system covers the same time period used in the estimation of the BOP single equations (4.3) and (4.4).

The results obtained from the simultaneous estimations of the system, using 2SLS technique, are given in Tables VII-IX. The empirical findings from estimating the BOP equations (4.13) and (4.15) are reported in Tables VII and VIII respectively. The empirical findings from the estimation of the monetary authorities' reaction functions of equation (4.14) are reported in Table IX.

The Simultaneous Estimation of the BOP

The empirical results from the simultaneous estimation of the BOP equations show a slight improvement over the results obtained from the single equation estimates of Tables III and V. The simultaneous estimates, using the direct estimation of the BOP are given in Table VI, while Table VIII reports the simultaneous results from the indirect estimation.

The major improvement is shown in the estimate of the offset coefficient, $\partial g_R/\partial g_{DC}$. The offset coefficient estimates carry their expected negative sign and are statistically significant at the 5 percent level in all cases using both money definitions.(23) Such findings may suggest that the monetary authorities in these countries are concerned with the stability of the base money (and the total money supply) and not merely with its distribution between domestic and foreign sources. The results reported in both tables indicate that better estimates of the BOP equations are obtained in Libya and in Saudi

Arabia as compared with results from the OLS estimation. The simultaneous estimates of the coefficient of the rate of change in domestic credit are not only statistically significant at the 5 percent level but, all money coefficients are not different from -1.0.[24] Therefore, based on these empirical findings, it is suggested that in the case of Libya and Saudi Arabia the domestic credits variable should be treated endogenously for the estimation of the BOP. But, our empirical findings in case of Kuwait as shown in Tables III, V and VI support the exogeneity assumption of the domestic credit variable as postulated by the MABOP.

As indicated by the direct estimation of the BOP reported in Table VII the estimates of the coefficient of the real income variable carry the postulated positive sign in agreement with the monetarists' assumption that an increase in real income improves the BOP temporarily and raises the level of foreign reserves, a result which is supported by the results the simultaneous as well as the single equation estimation of the BOP. The estimates of the coefficient of the expected inflation variable carry the expected negative sign in all regressions. However, neither coefficients of the rate of changes in real income nor the expected inflation are significant at the 5 percent level, which are the same results obtained by the single equation model. The exception to these findings is the estimate of the are real income variable in Saudi Arabia, with the regression using M2, where its estimate has shown a low 10 percent level of significance. The estimates of the coefficient of the price variable have the expected positive sign for both countries whatever the money definition used. However, in the Libyan case the price coefficient is significant at the 5 percent level for the

TABLE VII

ESTIMATES OF THE BOP EQUATION (4.13) USING DIRECT ESTIMATION AND 2SLS

money used	α_1	α_2	α_3	α_4	α_5	$\bar{R}^2$	DW	rho	SER
Libya, 1970QIII - 1979QIV:									
M1	0.682	0.257	-0.010	-0.807	-1.084	-.52	2.089	-0.433	0.178
	(1.780)	(0.740)	(1.148)	(1.069)	(6.435)				
M2	0.764	0.168	-0.0095	-.852	-1.115	0.53	2.065	-0.419	0.176
	(1.966)	(0.497)	(1.113)	(1.734)	(6.992)				
Saudi Arabia: 1970QIII - 1982QV:									
M1	0.320	0.101	-0.001	-0.943	-1.006	0.99	1.983	0.466	0.096
	(0.962)	(1.478)	(0.356)	(4.286)	(55.776)				
M2	0.417	0.088	-0.00004	-1.032	-0.9995	0.99	2.038	0.606	0.071
	(1.778)	(1.814)	(0.0042)	(8.158)	(62.636)				

Notes: (1) All notations and variables are as explained in the notes of Table III.

(2) All regressions are corrected for serial correlation using Maximum Likelihood Iterative Technique, which is a two-stage iterative method, and the rho reported is the final value for rho.

(3) The estimation procedure was done by the TSP version 4.00, (1983).

(4) Figures in parentheses are t-values.

regression using M2, and is significant only at the 10 percent for the regression using M1. In the Saudi case, the estimated coefficient for the price variable carries the predicted sign, but is not significantly different from zero in the regression using M1 and is significant only at the 10 percent when M2 is used. Such finding differs from those obtained by the single equation.

The simultaneous estimations of the BOP using the indirect method of equation (4.15) are reported in Table VIII. The key monetarist assumption concerning the offset coefficient, $\partial g_R/\partial g_{DC} = -1.0$, is confirmed by all the regressions and under both money definitions. The simultaneous estimates of the coefficient of the domestic credit variable have the right sign. They are also significant at the 5 percent level and equal -1.0 for all regressions and money definitions. Therefore, in contrast to the single equation estimation, the simultaneous estimates do support the MABOP's assertion of one-to-one negative relationship between the rate of change in net domestic assets, g_{DC}, and the BOP. The estimates of the coefficient of the demand for money variable carry the expected positive sign except in the Saudi regression using M2. Moreover, all estimates of the money demand variable are insignificantly different from zero, except for the Libyan regression using M1. All regressions, with the exception of regression using M1 in Libya, suffered from the problem of serial correlation which was corrected using the maximum likelihood iterative technique.(25) The money multiplier variable's estimated coefficient carries the correct sign, but it is statistically significant only in the Saudi regressions.

In conclusion, the simultaneous estimations of the BOP, whatever the money definition used, have shown a slight improvement over the

TABLE VIII

ESTIMATES OF THE BOP EQUATION (4.15) BY INDIRECT ESTIMATION AND 2SLS

money used	β_1	β_2	β_3	$\bar{R}^2$	DW	F	SER
Libya: 1970QIII - 1979QV:							
M1	0.499 (2.272)	-0.323 (0.331)	-1.096 (3.366)	0.50	2.17	--	0.182
M2	0.203 (0.938)	-0.674 (1.254)	-1.202 (7.143)	0.44	2.03	-0.431	0.193
Saudi Arabia: 1970QIII - 1982QIV:							
M1	0.303 (1.437)	-1.116 (4.868)	-1.029 (46.156)	0.99	1.575	0.411	0.1032
M2	-0.018 (0.076)	-1.220 (6.456)	-1.058 (31.009)	0.99	1.180	0.602	0.101

Notes: (1) All notations and variables are as explained in the notes of Table V.

(2) Regression using M2 in Libya and both regression of Saudi Arabia are corrected for serial correlation, using the Maximum Likelihood Iterative Technique, which is a two-stage method. The rho reported is the final value of rho.

(3) The estimation procedure was done by the TSP version 4.00, (1983).

(4) Figures in parentheses are t-values.

single equation models in both Libya and Saudi Arabia as far as the domestic credit is concerned. Therefore, one may say that the simultaneous estimation, which accounts for the problem of interdependence between the domestic and foreign money sources of the base money, performs slightly better than the single equation model, especially when the offset problem is concerned [see Tables (III and VI), and (V and VIII)].

The Simultaneous Estimation of the Monetary Authorities' Reaction Function

Concerning the simultaneous estimation of the monetary authorities' reaction function, the results obtained for the three countries are reported in Table IX. The coefficient of the rate of change in net foreign reserves, g_R, indicates the extent of the monetary authorities' effort to sterilize the changes in net foreign reserves from affecting the monetary base. Judging from the empirical estimates of the coefficient of sterilization, $\partial g_{DC}/\partial g_R$, sterilization policies have been in practice in these countries, at least during the period covered by this research. In all cases the estimates of the coefficient of sterilization carry the correct negative sign and are significant at the 5 percent level. Moreover, the estimates of the coefficient are approximately equal to -1.0. Only the Saudi sterilization coefficient is statistically equal to -1.0. These findings indicate that the monetary authorities of these oil exporting small economies appear to sterilize completely, or near completely, any change in the base money caused by the foreign reserves inflow. Therefore, given that exchange rates were always pegged during the period of study, the monetary

authorities of Libya, Kuwait and Saudi Arabia would have almost complete control over their money supplies.(26) Such findings, in fact, reflect the financial position of these countries. They are rich oil exporters and none of them suffered from foreign reserve shortages, at least during the time span of this study. The oil "boom" accompanying the oilprice hikes of 1970's and the 1980's had affected their financial performance to a large extent. Such huge earnings of foreign exchange help guarantee a steady inflow of foreign reserves which made their sterilization policies possible. Therefore, as the level of foreign reserves increased, the monetary authority in each country was able to step in to freeze its effect on the base money and hence the nominal money supply. For example, if the Libyan monetary authorities predicted that the rate of change in foreign reserves will increase by 10 percent, they would reduce the rate of growth of domestic credits by 8.2 percent (see Table IX). So, one may say sterilization policies in Libya have succeeded in preventing foreign reserves accumulation from fully increasing the country's base money. Thus, the monetary authority was able to exert control over the total money supply.

Among the other exogenous explanatory variables used in the specification of the reaction function, the rate of inflation appears to have a significant influence in Kuwait and Saudi Arabia. However, the coefficient of the rate of inflation carries the wrong sign except in the Libyan case. Using a one tail t-test, the estimates of the coefficient of inflation are significant at the 5 percent level, which implies that maintaining price stability has been among the policy objectives in Kuwait and Saudi Arabia. In fact, judging from the coefficient of the inflation predictor in the country equation, Saudi

Arabia' Monetary Agency, SAMA, has paid considerable attention to the problem of inflation.(27)

The income variable has the right sign in Libya and Saudi Arabia, however, the estimated coefficients are insignificantly different from zero. In Kuwait the coefficient of real income is significant at the 5 percent level but carries the wrong sign. Thus, the contention that a change in domestic credits depends on real income is supported only by the Kuwaiti findings. The government budget deficit variable in Libya and Kuwait exerts no significant effect on the rate of change in domestic credits, despite having the correct sign. Only the fiscal variable in the Saudi Arabia case appears to be a significant variable. It carries the correct sign and is significant at the 5 percent level. The latter result shows the importance of the fiscal pressure when determining monetary policy in Saudi Arabia.

According to the results obtained, the central banks of these economies have effective control over the base money. Therefore, they responded strongly to neutralize the impact of foreign reserves flow (in or out) on their nominal money supplies, even though foreign reserves, over the covered period, have fluctuated and grown rapidly. The results indicate that the central banks in these economies supplied money according to the needs of their economic activities and managed their credit policies in a way to furnish the required credits for their economic development. However, since the t-statistics were insignificant except for the net foreign reserves variable, (especially in Libya and Kuwait), following Willms (1971), we estimated the monetary function using only net foreign assets as an explanatory variable.(28) The results obtained from the estimation support the findings above,

TABLE IX

ESTIMATION OF THE REACTION FUNCTION EQUATION (4.14) BY 2SLS

θ_0	θ_1	θ_2	θ_3	θ_4	θ_5	$\bar{R}^2$	DW	rho	SER
				Libya: 1970QIII - 1979QIV					
0.018	-0.875	0.203	-0.004	0.116		0.59	2.076	-0.391	0.167
(0.500)	(6.573)	(0.389)	(0.519)	(0.209)					
				Saudi Arabia: 1970QIII - 1982QIV					
0.042	-1.064	0.123	0.004		0.223	0.99	2.012	0.300	0.098
(1.459)	(42.451)	(1.377)	(2.674)		(1.948)				
				Kuwait: 1973QII - 1982QIV					
0.036	-0.933	-1.279	0.022	-0.005		0.77	1.956	-0.498	0.160
(1.323)	(7.940)	(2.257)	(2.712)	(0.742)					

Notes: (1) The dependent variable is the rate of change of net domestic credits creation by the central bank in each country, weighted by the domestic component's share in base money, $(1 - k)g_{DC}$ where $k = R/H$.

(2) The independent variables are the rate of change of net foreign assets, weighted by this foreign component's share in base money, kg_P, the rate of change of expected real income, g_y, the rate of change of inflation, g_π, and the rate of change of budget deficits, g_{GBD}, but since data on the budget deficits are not available for Saudi Arabia, g_{GEXP}, Barro's fiscal variable was used instead. See the text for the definition of this variable.

(3) θ_0 is the coefficient of the constant, g_{GEXP}.

TABLE IX (Continued)

(4) Figures in parentheses are t-values.

(5) Since all regressions suffer the problem of serial correlation, all regressions were corrected for serial correlation using the Maximum Likelihood Iterative Technique, which is a two-stage interative method. And the rho reported is the final value of rho.

(6) The estimation procedure used is the TSP version 4.00 (1983).

(7) All other notations are as explained in the previous notes.

that active sterilization policies were practiced by the monetary authorities of the three countries. The sterilization coefficients obtained were 1.039, 0.83 and 0.76 for Saudi Arabia, Kuwait and Libya, respectively. Apparently, all countries do sterilize the impact of foreign reserve changes on the money supply since the estimates of the changes in net foreign assets are statistically significant at the 1 percent level. The sterilization is complete in the case of Saudi Arabia but only partially complete in the Kuwaiti and Libyan cases.

Finally, judging by the relatively high coefficients of determination, $\bar{R}^2$: 0.99, 0.77, and 0.59 (and 0.98, 0.71 and 0.67 when changes in foreign reserves is the only explanatory variable) for Saudi Arabia, Kuwait and Libya, respectively, one may say that the variation in the domestic credit variable is fairly well explained by the overall specifications of the reaction function presented. However, these empirical findings should be interpreted with caution since the function we used is built on an ad hoc basis and has not been derived from a macromodel. Thus, it is possible that the specification of the reaction function this study used may not be exactly accurate, especially since most of the regressions suffered from the problem of serial correlation.

ENDNOTES

[1]For more details on the approach's theoretical development and its conceptual meaning consult Chapter III of this thesis.

[2]This long run standard model assumes all goods are tradables. However, if non-traded goods are assumed, the rate of change of the domestic price level (the domestic rate of inflation) can diverge from the rate of change of prices abroad. But, in the real world, home inflation diverges from its world counterpart, and when the domestic rate of inflation is high, it tends to worsen the competitiveness of home goods and to reduce the real yield of home financial assets. Both factors will tend to worsen the BOP. See Tullio (1976) p. 44 and Batiz and Batiz (1985) pp. 466-467.

[3]The coefficient for the rate of change of prices is expected to equal unity due to the homogeniety assumption of the demand for money with respect to prices.

[4]The test to show whether the estimates of a coefficient are statistically equal 1.0 or not is done by calculating a t-ratio as follows: $t_{CAL} = |1 - \hat{\beta}|/S_{\hat{\beta}}$, where $\hat{\beta}$ is the estimate of the tested coefficient and $S_{\hat{\beta}}$ is its standard error. If the calculated t-value shows that the difference is significant at the 5 percent level, then we conclude that the estimated coefficient is significantly different from -1.0; otherwise it is significantly equal to -1.0. For example, using the results from regressions with money (M1) given in Table IV: t = (1 - 1.023)/0.048 = 0.475, t = (1 - 0.976)/0.01 = 2.192, and t = (1 - 9.673)/0.109 = 3.000, for Kuwait, Saudi Arabia and Libya, respectively. Only in the Kuwaiti equation is the estimate of the coefficient of net change in domestic credit statistically equal to -1.0. In the other two countries the estimates are significantly different from -1.0. The test difference from -1.0 in the Kuwaiti case does support the contention of

the MABOP. The same test needs to be done for regressions using the broad definition of money as well as for the estimates of the coefficients of the money multiplier.

[5]For the MABOP to be supported by the empirical results, the rate of interest, which is approximated here by the expected rate of inflation, and the price level must serve as the determinants of the demand for money and behave as if the international goods and capital markets are highly integrated. See Johnson (1972, and 1976), Wilford-Wilford (1977), and Putnam-Wilford (1978). This indicates that the price level should carry a positive sign and the opportunity cost variable should carry a negative sign, regardless of whether domestic or world variables are used in the BOP equation. When domestic price and interest rate variables carry different signs from their world counterparts, it is an indication that the world goods and capital markets are not well-integrated as the MABOP asserts. Meanwhile, carrying the right sign and significant coefficients is an indication of highly integrated world goods and capital markets.

[6]It is assumed that the actual stock of money adjusts to demand within a single period (year or a quarter). A straight-forward adjustment mechanism between the actual and desired money stock is as follows:

$$\Delta \ln(M/P)_t = \lambda[\ln(M/P)_t^d - \ln(M/P)_{t-1}], \qquad 0 < \lambda < 1$$

where λ is the adjustment coefficient. This simply assumes that in the short period the public would always make some correction to money stock held in the previous quarter. This involves the assumption that the actual stock of money adjusts proportionally by a fraction (λ) of the difference between the desired demand for real balances in the current period and the actual stock of money available in the previous period. See D. Morgan (1979) p. 83.

[7]In Saudia Arabia interest payments are prohibited by law. However, when the interest rates do exist as in the case of Libya and Kuwait the rates are pegged by the monetary authorities at low rates which prevents them from reflecting the conditions of their money

markets. For example, interest rates in Libya vary from as low as 2.5 percent for interbank loans to as high as 7.5 percent on commercial loans. Time and saving deposit rates range between 3.25 percent as a minimum and 4 percent for a maximum. See CBOL Economic Bulletin, (1983), Table 17. In our case countries, in fact, the market interest rates do not carry the job of the credit allocation function, because the allocation of credits is done by the government economic policies, based upon the goals of the economic plans. For more details see Chapter II.

[8]Dornbusch and Fisher (1981, p. 244) suggested that: "...in markets where interest rates are controlled, and the rates do not rise to reflect expected inflation, individuals begin to think of the alternative of buying goods rather than holding money when expected rate of inflation rises. The expected inflation rate itself then becomes a separate influence on the demand for money."

[9]With regard the specification of equation (4.8), the inflationary expectations variable enters linearly because the inflation rate would be undefined if this variable enters in logarithmic form. Therefore, equation (4.8) appears in semi-logarithmic formulation. See Aghveli and Khan (1978), p. 388.

[10]Polican and Choi (1978) have argued that higher prices could have a positive effect on a household's money demand. However, for Saudi Arabia, Fadil indicated that the ambiguity of the behavior of the inflation variable is to be expected in view of the high subsidy elements in the household expenditure. See Fadil (1985), p. 70.

[11]In the case of Saudi Arabia it is reasonable to have a high income elasticity of demand for money, since interest payments on all types of deposits including the time and Savings deposits are prohibited by law. Thus for a given percentage increase in income, individuals increase their cash and demand deposits since savings do not earn any income.

[12]A series of seasonal dummies were used to account for seasonality in the demand for money, but they were dropped since the F statistics for such dummies were statistically insignificant in all cases.

[13]The price and income variables are both positively correlated with the BOP, while expected inflation is assumed to enter negatively in the BOP equation. Therefore, the total effect of the demand for money variable is expected to be positive. See Table V in the text.

[14]The calculated t-statistics for the difference of the estimates of the coefficients of the money supply variables from -1.0 are given as follows:

	g_m		$(DC/H)g_{DC}$	
	M1	M2	M1	M2
For Libya	-0.168	-0.286	-1.929	-1.991
For Kuwait	-1.282	-0.837	-0.568	-1.610
For S. Arabia	-0.020	-0.207	-3.444	-3.333

The t-values show that all estimates of the coefficient of changes in money multiplier are statistically equal to -1.0 in all countries. However, only the estimates of coefficient of change in domestic credits in Saudi Arabia failed to support the monetary assumption, since it is significantly different from -1.0 for M1 and M2.

[15]The calculated t ratios for the difference are:

The t-value: $t = |1.0 - \hat{\alpha}|/S_{\hat{a}}$

For Libya: $t = -0.260/0.095 = -2.74$ for M1
$t = -0.280/0.110 = -2.55$ for M2

For Kuwait: $t = -0.074/0.055 = -1.345$ for M1
$t = -0.034/0.037 = -0.919$ for M2

For S. Arabia: $t = -0.034/0.008 = -4.250$ for M1
$t = -0.034/0.007 = -4.857$ for M2

Only in Kuwait does the difference equal -1.0 in support of the MABOP.

[16]This outcome, in fact, contradicts the strong and adequate support which has been obtained from several empirical studies using data from the more developing economies. See the works of Zecher (1974) on Australia, Bean (1976) on Japan, and Putnam-Wilford (1978) on a group of European countries. All these studies documented strong support for the MABOP.

[17]For example a contractionary monetary policy via open market

operation will have a partial success if the economy is open to the ROW. The resulting excess demand for money due to the decrease in the money supply will find in the BOP a channel through which the additional money demand leaks into the economy. On the other hand, if too much money is pumped into the economy, the country's residents will dispose of the redundant money through the external sector by increasing their demand for foreign goods and assets, thereby generating an outflow of reserves which tends to damp the expansionary effect of that monetary policy. For more details on monetary policy in an open economy, see Komiya (1969), Johnson (1972) or any related source.

[18]A sterilization is the monetary authority's action to interfere in the automatic adjustment in foreign reserves in response to changes in domestic credits. For example, the sterilization process's goal is to neutralize all or part of the changes in foreign reserves so that the monetary base will not fluctuate with exogenous variables.

[19]All studies of the central bank's reaction function used an explicit constrained optimization model where the reaction function usually takes the form of a linear function of target variables, measured as deviation from the optimal levels, as well as exogenous variables which are included in the constraint equation. For such formulation see J. Wood (1967) and P. D. Jonson (1974). Or they used an ad hoc approach where the reaction function is specified as a linear function of some variables which are likely determinants - either in view of the history of policy or implied by economic or the political economic theory - of policy under the assumption that stabilization authorities were reacting endogenously to the course of the economy. See M. Keran and C. Babb (1969), M. Willms (1971), Miller and Askin (1978) and Willet and Lancy (1978), among others.

[20]In the literature on the reaction function no general agreement exists as to the target variables to be included to present the external transaction goal, nor on which variable to use as representative of the overall thrust of the monetary policy. The interest rate, the money supply, the total monetary base, the unborrowed reserves and the domestic component of base money, all have been used by writers to represent the dependent variable in the works on the reaction

function. See J. Tullio, (1976), p. 85, and S. M. Lee (1985) p. 177.

[21]No generally accepted, well specified, single model which describes the behavior of the monetary authorities exists. So one can use it to explain the impact of the BOP and other objective variables on money, and solve the problem of modeling the monetary authorities' behavior.

[22]For more about this type of presentation of the system, see Genberg (1974 and 1976), Tullio (1976) and Shin (1977) among others.

[23]The simultaneous estimates of the BOP equation are reported only for the Libyan and Saudi cases since the Kuwaiti data did confirm the MABOP contention concerning the exogeneity of the domestic credits variable in the single equation estimations reported in Tables III and V in the text.

[24]This implies that when the rate of accumulation of foreign reserves increases, the monetary authorities step in to freeze part of the reserves accumulation. Such a policy action insures that the inflow of foreign reserves will not fully influence the base money. Thus, as a result the monetary authorities' control over the nominal money supply will be maintained.

[25]The maximum likelihood iterative technique is a two-stage iterative method. A trial value of rho is computed and the data is transformed according to the equation:

$$Z_t = 1 - (rho)^2 \cdot Z_t \qquad \text{for } t = 1$$

Then the regression is run on the transformed data. A new value of rho is computed, and the process is repeated until rho does not change from one iteration to the next. See the reference manual for TSP version 4.00, (1983), pp. 32-30, and also, Beach and Makinnon (1978), pp. 51-58.

[26]When the monetary authorities' sole goal is to maintain control over the money supply for the pursuit of domestic goals, the impact of net foreign reserves on the base money must be sterilized completely by an opposite movement in domestic credits. This implies a sterilization coefficient of -1.0. But, if the monetary authorities' sole objective is to attain external balance by allowing the flow of foreign reserves

to alter the base money, hence the money supply, they may need to follow a passive policy of no sterilization which implies the sterilization coefficient to be zero.

[27]In the long run, control over the money supply depends upon the country's level of foreign reserves. Thus, ample foreign reserves will allow the existence of a domestic rate of inflation in excess of the world's. And without enough foreign reserves a monetary expansion will require a devaluation. See Miller and Askin (1978), p. 233.

[28]The monetary equation, using changes in net foreign assets as the only explanatory variable to explain the variations in net domestic credits, produced results in support of the assumption that active sterilization policies by all countries have been practiced over the period covered by this research. The estimations of the equation are given as follows:

For Libya: $(1 - k)g_{DC} = 0.020 - 0.761(k)g_R$

(0.019) (0.083)

$R^2 = 0.67$ DW = 2.103 rho = -0.42 SER = 0.155

For Kuwait: $(1 - k)g_{DC} = 0.017 - 0.830(k)g_R$

(0.033) (0.086)

$R^2 = 0.71$ DW = 2.321 rho = -0.244 SER = 0.181

For S. Arabia: $(1 - k)g_{DC} = 0.088 - 1.039(k)g_R$

(0.031) (0.019)

$R^2 = 0.98$ DW = 1.934 rho = 0.25 SER = 0.123

where figures between parentheses are standard errors.

CHAPTER V

PRICES AND THE BALANCE OF PAYMENTS

Introduction

The standard monetary approach model introduced in the previous chapters deals with long run equilibrium analysis, where relative prices, in the small open economy under a fixed exchange rate, are assumed exogenously determined. The model also assumes that world commodity and capital markets are highly integrated. Thus, the equilibrium version of the MABOP asserts that all goods are considered tradables, and no barriers to international trade are present. Accordingly, that version of the monetary approach looks to all price movements as being globally determined, rather than being caused by changes in a particular country's domestic price level. The approach relies on arbitrage activities to equalize prices (including interest rates) across countries whenever a deviation between a tradable good's home and world prices occurs. This implies that the price of a good expressed in some common currency is expected to be the same in all countries, or what is known as the "law of one price" or the "integrated world market hypothesis" [Wilson (1986) and Genberg (1976)].

However, in the real world the low degree of capital mobility, the barriers to trade and the existence of a large proportion of output which does not enter world trade, even in the case of small open

economies under fixed exchange rates, may result in different prices among countries, at least in the short run. This chapter tests the assumption of the integrated market hypothesis using price data from Libya, Kuwait and Saudi Arabia. The standard monetary model will be modified to explain why prices across countries differ from their world counterparts. After testing the "integrated market hypothesis", the relationship between prices and the BOP will be investigated. The empirical testing will be carried out using a modified version of the basic monetary model, which introduces the non-tradables sector in the domestic economy into the analysis to allow for short run variations of price levels across countries. The modified model differs from the long run standard model in that it not only traces the adjustment of BOP to domestic money imbalances, but the short run price adjustments to such monetary disturbance are also considered. The model is introduced, then an empirical investigation of that model is presented. The chapter ends with some comments and general concluding remarks.

The Integrated Market Hypothesis

One major proposition made in the standard monetary long run analysis is that all prices in the small open economy are linked to their world counterparts. All prices movements are globally rather than domestically determined. The standard monetary approach assumes a direct relationship only between changes in the domestic money supply and the BOP, hence, it implies the following assumptions are valid: (i) All goods are treated as traded goods. (ii) There are no barriers to international trade, at least over the adjustment period. and (iii) Though price indices are affected by the non-conformity of the weighting

procedures among countries, the model assumes that in constructing the aggregate price index, weighting patterns used are the same. However, even in the presence of some trade impediments, as long as they remain constant over time, the price of traded goods and the general price level would change, but at the same rate among countries. Therefore, the monetary approach asserts that rates of inflation in all countries will be the same. The "integrated market hypothesis" in its crude version, can be expressed by the absolute form of the purchasing power parity, PPP, which is given as follows:(1)

$$P_h = E \cdot P_w \tag{5.1}$$

where P is the general price level with the subscripts h indicating the home country and w indicating the world, and the term E is the exchange rate. Equation (5.1) is also called the "law of one price" which indicates that goods are sold for the same price worldwide [Melvin (1986)]. But in reality, barriers to trade are present such as export and/or import taxes and subsidies do affect the relative prices. Thus, it seems more reasonable, particularly in empirical testing, to express the PPP in its relative form:

$$(\Delta P/P)_h = E \cdot (\Delta P/P)_w \tag{5.2}$$

where $\Delta P/P$ equals the rate of inflation and the other symbols are as defined above. Equation (5.2) states given the three previous conditions are held, inflation rate differences will be reflected in the value of the exchange rate.

The integrated market hypothesis has been subjected to various empirical studies to test its validity. The model we are going to use

in this research to test the "integrated market hypothesis" follows H. Genberg's model (1976), which he used to test the hypothesis with Swedish data.(2) According to Genberg, the artificial differences which result from the weighting patterns due to the construction methods of the price indices are captured by a random disturbance.(3) The equation to be used in testing the "integrated market hypothesis" is formulated as follows:

$$g_P = \beta_0 + \beta_1 g_P^* + e \ . \qquad (5.3)$$

Equation (5.3) expresses the home country's inflation rate, g_P, as a function of world inflation rate, g_p^* and a stochastic disturbance term, e. This formulation leads us to expect the constant term to be statistically equal to zero and the estimated coefficient of world inflation is equal to plus unity. ($\beta_0 = 0$ and $\beta_1 = +1.0$)

However, the inclusion of all countries' prices in the construction of the world rate of inflation may not seem reasonable since our sample countries' trade with many countries, especially the developing countries, is negligible. Besides, there is no major or dominant trade partner for each of our countries. Thus, two proxies are constructed to represent the world rate of inflation for each country. The methods used in the construction of world inflation rate are as follows:

1) The weighted world rate of inflation, WWINFL, is given by the weighted averages of the rates of inflation of the trading partners of each country. The weighting scheme used in each case is the trade partner's share of total trade with each case country.(4)

The weighted world rate of inflation in Libya, WWINFL is constructed, for example, by using a weighted average of the rates of

change in the consumer price index, CPI, of each trade partner that contributes 3 percent or more of Libya's total trade. The variables are the Italian rate of inflation, CPII, the German rate of inflation, CPIWG ... etc., for all countries and weights, see Table X. Thus, in Libya the weighted variable, WWINFL, is defined as:

$$\begin{aligned} WWINFL = [&(CPII * 35) + (CPIWG * 20) + (CPIFR * 11) \\ &+ (CPIJ * 10) + (CPIUK * 9) + (CPIUS * 7) \\ &+ (CPIGR * 4) + (CPISP * 4)]/8 \end{aligned} \tag{5.4}$$

2) The unweighted world rate of inflation, UWINFL, is measured by non-weighted average rates of inflation in the country's major trading partners. For example, in the case of Libya the unweighted world variable is defined as:

$$\begin{aligned} UWINFL = &(CPII + CPIWG + CPIFR + CPIJ + CPIUK \\ &+ CPIUS + CPIGR + CPISP)/8 \end{aligned} \tag{5.5}$$

The empirical estimations of equation (5.3) using both definitions of the world inflation variable for the three countries are reported in Table XI. The results obtained in the case of Libya and Kuwait do support the contention that the inflation rate in the small open economy moves with its world counterpart. But, this assumption is not supported by the empirical findings in the case of Saudi Arabia. The integrated market hypothesis predicts that the constant term is expected to be equal zero and the estimated coefficient of the world inflation variable to be equal to +1.0. The results presented in Table XI show that, whatever the measure of world inflation (WWINFL or UWINFL) used, the

TABLE X

THE WEIGHTS USED FOR CONSTRUCTING THE WORLD RATES OF INFLATION USING YEARLY DATA

Trade Partners	Weights		
	Libya	Kuwait	Saudi Arabia
France (FR)	0.11	0.05	0.06
Greece (GR)	0.04		
Holland (HO)			0.05
India (IN)		0.04	
Italy (I)	0.35	0.08	0.09
Japan (J)	0.10	0.30	0.29
South Korea (SK)		0.05	
Spain (SP)	0.04		
Switzerland (SW)			0.03
U. K.	0.09	0.13	0.09
U.S.A.	0.07	0.21	0.29
West Germany (WG)	0.20	0.14	0.13

Notes: - data on trade for are obtained from various issues of the IMF, Direction of Trade Statistics, Year Books: 1971-77, 1980, 1982 and 1984.

- All trade partners included have trade not less than 3 percent of Libya, or Kuwait ro Arabia's total trade with that country.

- All data used are yearly trade statistics, where the average covering 1970-79 for Libya, 1973-82 for Kuwait, and 1970-82 in the case of Saudi Arabia.

- The summation of weights equal one: $\Sigma w_i = 1.0$

TABLE XI

ESTIMATION OF THE INTEGRATED WORLD MARKET HYPOTHESIS OF EQUATION (5.3)

Variables / Countries	Constant	WWINFL	UWINFL	$\bar{R}^2$	DW	F	SER
Libya: 1965-80:							
1.	-3.427 (0.501)	2.830 (2.343)	--	0.23	1.85	5.5	12.05
2.	-2.001 (0.308)	--	1.513 (2.260)	0.21	1.86	5.1	13.73
Kuwait: 1972-82:							
1.	-0.988 (0.234)	0.911 (2.499)	--	0.324	2.18[b]	5.8	4.51
2.	-3.406 (0.728)	-- --	1.042 (2.780)	0.386	2.05[b]	7.3	4.32
Saudi Arabia: 1968-82:							
1.	0.750 (0.953)	0.797 (1.168)	--	0.07[a]	1.479[b]	1.0	7.83
2.	-1.060 (0.136)	--	0.955 (1.460)	0.05[a]	1.539[b]	1.7	7.64

Notes: - The dependent variable is the rate of inflation in Libya, Kuwait and Saudi Arabia. While the independent variable is the world rate of inflation as defined in the text.

- Regression (1) uses the weighted measure of world inflation.

- Regression (2) uses the unweighted measure of world inflation.

a - R_s^2 are adjusted for the degrees of freedom, except in the Arabian regressions because $\bar{R}_s$ are negative the regular R_s^2 are reported.

b - These regressions are corrected for serial correlations using the maximum likelihood iterative method. The final values of rho are: (0.49, 0.54) and (0.66, 0.65) for Kuwait and Arabia, with regressions (1) and (2) respectively.

constant term carries its theoretically predicted value for our three countries, since it is insignificantly different from zero at the 5 percent level in each of the three countries. However, the estimates of the coefficient of the world inflation variable, using both definitions, are statistically significant at the 5 percent level and have the right sign; moreover they also are statistically equal to +1.0. Therefore, the assumption that $\hat{\beta}_1 = +1.0$ cannot be rejected in these two cases. The results from the Saudi regressions using both definitions of world inflation failed to confirm the theoretical prediction of the model concerning the estimates of the coefficient of world inflation variable. The assumption is rejected since the estimated coefficient is statistically equal to zero at the 5 percent level whatever the inflation definition of world inflation used.

Generally, the Kuwait regressions show best results among those of the three countries. The Libyan and Kuwaiti regressions have significant F statistics and relatively low R^2. But, the performance of the Libyan regressions must be taken with caution, since both regressions have high standard errors, especially for the coefficient of the WWINFL variable. In fact, the regressions using the unweighted world inflation show a slight improvement in the Kuwaiti and Libyan cases. In Saudi Arabia, whatever the world rate of inflation used (WWINFL or UWINFL), no significant change is reported. Both Saudi regressions suffer from low $\bar{R}^2$ and insignificant F statistics which indicate the poor performance of the model as far as the Saudi data are concerned. Finally, one may conclude that the empirical findings from WWINFL and UWINIF regressions, though not impressive, seem to support the "integrated market hypothesis" in the cases of Libya and Kuwait, but

not in the case of Saudi Arabia.

The results from the Saudi Arabia regressions may reflect the importance of the non-traded goods sector in this economy. The observance of a small open economy under fixed exchange rates with a rate of inflation different from the world inflation rate is a common phenomenon, particularly in the developing economies. This result violates the PPP assumption, because these countries face low degrees of capital mobility and barriers to trade such as tarrifs, import restrictions, export subsidies and the like. Added to these factors the existence of a large proportion of domestic goods which compete for the available resources but do not enter foreign trade, all may result, even in the case of a small open economy under fixed exchange rates, to different price levels among countries, at least in the short run.

The behavior of prices and the BOP in the small open economy in the short run will be investigated using the traditional monetary analysis. The model of the MABOP developed in the previous chapters will be modified to explain the situation where different rates of inflation among countries are a possibility. The modified model will rely on both the existence of the non-traded goods sector and on the money market conditions as used by the standard monetary model. However, it differs from the standard model for it not only traces the adjustment of BOP to domestic monetary imbalances, but it also traces the short run price adjustments to these monetary disturbances as well.

The Modified Model

The theoretical development of the modified model follows the works of Parkin (1974) and Blejer (1977) and Blejer and Leiderman 1981).[5]

The model to be used in this study is composed of the equilibrium conditions in the markets for money and the traded and non-traded goods. The first five equations are the basic equations of the monetary sector of the small open economy used above. In addition, two equations to explain the domestic inflation and the ex ante excess flow supply of money are derived and added.

As a starting point, the simple monetary sector in a small open economy is given by the first five equations which are used by the monetary approach opponents to derive the standard long run model of the BOP. Additional equations are added to explain the domestic inflation and the ex ante excess flow supply of money. The first part of the modified model is given by:

$$(M^d/P) = m^d = f(y, OC) \tag{5.6}$$

$$M^d = P \cdot m^d = P \cdot f(y, OC) \tag{5.7}$$

$$M^s = m \cdot H \tag{5.8}$$

$$H = R + DC \tag{5.9}$$

$$M^s = M^d \tag{5.10}$$

These equations have been explained and discussed in Chapter III of this research, however, they are repeated here for presentation purposes. All variables are as defined before.

Equation (5.6) presents the real demand for money; equation (5.7) shows the same function but in nominal terms; equation (5.8) gives the nominal supply of money; equation (5.9) defines the base money; and equation (5.10) is the money market clearance condition. The money

market is assumed to clear such that the ex post actual stock of money is equal to the demand for nominal money balances. However, ex ante, the stock of money can differ from its demand.

The monetary approach views the BOP as an adjustment process that works to correct the disturbance in the money market such that the market ultimately clears. Therefore, the monetary approach defines the BOP as the rate of change of the international reserve holdings of the banking system. Now, to view the BOP as an adjustment process in the face of a disturbance in the money (stock) market the approach resorts to the flow equilibrium condition in the monetary sector,(6) i.e. $g_{M^s} = g_{M^d}$, which means the rate of change in the supply of money equals the rate of change of the nominal demand for money. Therefore, utilizing this flow equilibrium condition, substituting for the respective relations in both sides and making the necessary arrangements we arrive at the BOP equation (what is termed as the standard model of the MABOP):

$$(R/H)g_R = (g_{m^d} + g_P) - [g_m + (DC/H)g_{DC}] \qquad (5.11)$$

Equation (5.11) expresses the BOP (the rate of change in foreign reserves) as a function of the rates of change of nominal demand for money as stock and the nominal supply of money under the monetary authority's control. This presentation expresses the BOP as a function of a "flow excess supply of money."(7) Equation (5.11) states that an excess of domestic money supply over money demand will result in a BOP deficit while the reverse produces a BOP surplus. Equation (5.11) is based on a long run analysis, where all needed adjustments to the monetary disturbance take place via the adjustment in the BOP [Johnson

(1972), Aghevli and Khan (1977) and Genberg (1976)].

As Swoboda (1973) has indicated, the presence of some kind of barriers to trade and payments and a large proportion of domestic goods which do not enter international trade tend to slow the speed of adjustment in the face of a monetary disturbance even in the long run. In the short run, relative prices can be affected by domestic monetary policy. This analysis suggests that society will react to monetary disturbances by changing not only the level of the foreign component of base money, R, through adjustments in the BOP, but also the rate of change in the domestic price level from those of world rates. Therefore, the basic model previously used needs to be extended to permit the flexibility in relative prices. To meet this requirement, Mario Blejer (1977, 1981) introduced some modification on the standard monetary model which account for the short run variations in prices among countries. This modification allows for domestic monetary policy to influence not only the BOP but also the domestic price level as well. To make the model operational, a new endogenous variable is added to account for the rate of change in the domestic price level. Now, the modified model has two endogenous variables, the rate of change of the domestic price level and the rate of change in net foreign reserves.

The model is composed of the equilibrium conditions in two sets of markets, the money market as presented by the set of equations (5.6) to (5.10) and the markets for two classes of goods which are consumed and produced in the country. These goods are defined as traded and non-traded goods [Dornbusch (1973)]. The introduction of non-traded goods serves to deal with the situation where relative prices can be affected by domestic monetary policy. However, before the introduction of traded

and non-traded goods, denote G to represent the difference or gap between the ex ante changes in the domestic money supply and the changes in the money demand. To obtain the gap, G, substitute the flow of nominal demand for money from the flow supply of money variables under the monetary authority's control. The difference, or the gap, G, will be called the monetary variable, namely the ex ante excess flow supply of money, EAEFSM:

$$G = [(DC/H)g_{DC} + g_m] - (g_{m^d} - g_P) \tag{5.12}$$

Next, assume the economy is producing and consuming the following two classes of goods:

(1) The first class of goods, the tradables, include both exportables and importables. Let P_T be the price of this class of goods with P_X and P_M being export and import prices, respectively, and θ represents the share of exportables in the total expenditure on traded goods. Then the price of this sector, P_T, is given by:

$$P_T = \theta P_X + (1 - \theta)P_M \tag{5.13}$$

Following the small country hypothesis, the domestic prices in the traded goods sector are assumed to be determined by world market conditions expressed in domestic currency: $P_X = E \cdot P_X^*$ and $P_M = E \cdot P_M^*$, where * indicates world, and E is the exchange rate. Therefore, the domestic price of traded goods is given by the following:

$$P_T = \theta(E \cdot P_X^*) + (1-\theta)E \cdot P_M^* = E \cdot [\theta P_X^* + (1-\theta)P_M^*] = E \cdot P_T^* \tag{5.14}$$

where P_T^* denotes the price of a basket of traded goods in the country of consideration expressed in foreign currency [Batiz and Batiz

(1984)]. For a small open economy under fixed exchange rates regime, P_T^* is exogenously determined by the conditions in the world markets for these goods. This result is in agreement with the standard model, where the prices of traded goods, P_T is an exogenous variable.

(2) The second class of goods are those which do not enter world trade, the non-traded goods. They are goods which are domestically produced and consumed. They compete for the available resources with the traded goods. The prices of non-traded goods, P_{NT}, are determined by the supply and demand conditions of their domestic markets. However, the general price level in the domestic economy is determined by the prices in both sectors. Let β represents the share or weight of total expenditure allocated to the traded goods sector, then the general price level in the economy is given by:

$$P = \beta P_T + (1-\beta)P_{NT} \tag{5.15}$$

Equation (5.15) states that the price level in the domestic economy as a whole is determined by a geometrical weighted average of the prices of both classes of goods. The differentiation of equation (5.15) with respect to time gives the domestic rate of inflation as:

$$g_P = \beta g_{P_T} + (1-\beta) g_{P_{NT}} \tag{5.16}$$

Equation (5.16) expresses the domestic rate of inflation as a weighted average of the rates of change of prices of both goods, therefore, given the small country assumption g_{P_T} equals the world rate of inflation [Cross and Laidler (1976)].

Assuming both classes of goods are substitutable in consumption and in production, they compete for the available resources which are

allocated to these goods in accordance with their relative prices. Starting from an initial equilibrium point, suppose the monetary authority expands the domestic money stock by increasing the domestic credits in excess of what society desires to hold. This policy action creates a disturbance in the money market in the form of an excess supply of money which implies an excess demand for goods traded and non-traded. This situation will lead to a rise in the price of non-traded goods, P_{NT}, while P_T stays unchanged, but the relative price will change and the BOP will experience a deficit. The process will keep on working until equilibrium in the money market is restored, and the actual money supplied exactly equals what society demands. The adjustment process in this situation works through two variables, the price level (i.e., changes in prices of non-traded goods) and the BOP. The relative price depends on the excess demand of these goods and, an excess demand for goods implies an excess supply of money. Therefore, the assumption here is that the relative price between traded and non-traded goods is a function of the excess flow supply of money, G.[8]

Assuming that for each level of an ex ante excess money supply in the economy there exists a long run stable relative price of non-traded to traded goods, therefore, a functional relationship between relative prices and ex ante monetary gap can be shown as follows:

$$P_{NT}/P_T = ke^{\lambda G} , \qquad 0 < \lambda < \infty , \qquad (5.17)$$

where k is a constant and λ is the elasticity of relative prices with respect to the monetary imbalance, G. Equation (5.17) implies that for each level of the monetary gap (i.e., for the difference between the ex ante rate of money creation and the changes in the demand for money)

there exists a unique relative price of non-traded in terms of traded goods. However, in the long run, and after the disturbance disappears, no further changes in relative prices will take place. To make the relationship given by equation (5.17) operational, differentiation of equation (5.17) logarithmically produces:

$$g_{P_{NT}} - g_{P_T} = \lambda(\Delta G) \tag{5.18}$$

Equation (5.18) expresses the rate of change of the prices of non-traded goods in terms of the rate of change of prices of traded goods and the first difference of the monetary gap:

$$g_{P_{NT}} = g_{P_T} + \lambda\Delta G \ . \tag{5.19}$$

In turn, we can express the rate of change in domestic prices, g_P, given by equation (5.16) as a function of world inflation, g_{P_T}, and the excess flow supply of money without relying on the availability of data on the prices of non-traded goods. [The whole model and the derivation of the price and the BOP equations in the modified model are shown in Appendix B]. The system is solved for both endogenous variables, the domestic inflation, g_P, and the BOP or the rate of changes in net foreign reserves, g_R. The domestic inflation is expressed in terms of world inflation the ex ante excess flow supply of money (EAEFSM), and domestic inflation in the past period (last quarter), as follows:

$$g_P = \frac{1}{1-\lambda(1-\beta)} \cdot g_{P_T} + \frac{\lambda(1-\beta)}{1-\lambda(1-\beta)} \cdot \Delta[(DC/H)g_{DC} + g_m - g_{m^d}] + \frac{\lambda(1-\beta)}{1-\lambda(1-\beta)} \cdot g_{P_{-1}} \tag{5.20}$$

Substituting for the value of domestic inflation, as given by equation (5.20), into the standard monetary approach as expressed by equation

(5.11), the solution for the BOP is obtained as follows:

$$(R/H)g_R = \frac{1}{1-\lambda(1-\beta)}\cdot g_{P_T} + \frac{\lambda(1-\beta)}{1-\lambda(1-\beta)}\cdot\Delta[(DC/H)g_{DC} + g_m - g_{m_d}]$$

$$+ \frac{\lambda(1-\beta)}{1-\lambda(1-\beta)}\cdot g_{P_{-1}} + [g_{m_d} - g_m - (DC/H)g_{DC}] \; . \qquad (5.21)$$

The solution of the system given by equations (5.20) and (5.21) shows that, in the short run, the impact of a monetary imbalance is distributed between the BOP and the domestic inflation. The final distribution depends on the relative weight of traded and non-traded goods in total expenditures, β, and on the elasticity of relative prices of non-traded to traded goods with respect to the monetary gap, λ. Blejer and Leiderman (1981) distinguished three clear cases: The first extreme case is when relative prices are insensitive to the monetary disturbance ($\lambda = 0$), or when all goods are traded goods ($\beta = 1$). Then the model will be reduced to the standard long run monetary approach model of equation (5.11). And, the full impact of the monetary imbalance falls on the BOP. Another extreme case is when relative prices are highly sensitive to monetary disturbance ($\lambda = \infty$). All the impact of the monetary disturbance falls on the domestic inflation. The third case is when the impact of monetary disturbance falls between the two extremes: the higher the λ is and the lower the β is, the more impact of the monetary disturbance falls on the domestic rate of inflation and the less on the BOP. The reverse also holds true.

The Estimation of Prices and the BOP Equations

"The Estimation of the Modified Model"

The standard monetary approach assumes the validity of the "law of one price" as presented by the integrated market hypothesis. Thus, for

the small country case, the price level is the one prevailing in world markets. However, causal observations on data in many LDCs show rates of inflation which are higher than the world rate. Therefore, different rates of inflation across countries are possible. In fact, Blejer (1977) and Blejer and Leiderman (1981) incorporate a price equation to allow for different rates of inflation between countries. The modification of the standard model permits the treatment of price as an endogenous variable. The addition of the price equation will serve to deal with the phenomenon of price differentials across countries, which is assumed absent by the standard monetary model introduced in Chapter III.

The empirical testing of the integrated market hypothesis for the Saudi price data failed to confirm the validity of the "law of one price". Thus, the modified model as presented by equations (5.20) and (5.21) will be estimated using the Saudi price data covering the period 1970-QII - 1982-QIV. During that time period, the Saudi economy has experienced periods of inflationary pressure and periods of price instability. Besides the Saudi BOP experienced surplus in most of the period under consideration, with the exception of 1978 and 1982(9) [Keran and Al-Malik (1982) and Al-Tuwijri (1985)].

Since the monetary variable is the principle variable in this monetary model, the first step is to derive the ex ante excess flow supply of money variable which requires the estimation of the demand for real money function. The demand for real money balances has been previously estimated and summary of the results are reported in Table IV. Thus, utilizing this estimated demand for real money equation for Saudi Arabia, a series of predicted demand of real money balances, $\hat{m}^d$ is

generated. The predicted values are transformed into rates of change, $g_{\hat{m}^d}$. Now we subtract the rate of change of the estimated demand for money balance, $g_{\hat{m}^d}$, from the rate of change of the money supply under the monetary authority's control, $[(DC/H)g_{DC} + g_m]$. By doing so, the monetary variable which is called the ex ante excess flow supply of money, EAEFSM, is obtained.

The next step is to obtain the world rate of inflation. To generate the price of traded goods, two proxies of the world price indices are generated from the world consumer price index, WCPI, and the world wholesale price index, WWPI, of the major trading partners of Saudi Arabia. The weights used in generating the two indexes are the ones reported in Table X. The two equations were estimated using OLS technique.(10)

The Transformation of the Variables

Following the works of Blejer (1977) and Blejer and Leiderman (1981) substitute for the lagged endogenous variable P_{-1} recursively so that the endogenous variables will be expressed as functions of current and lagged values of the world inflation and the domestic monetary variable, EAEFSM. The use of this estimation method involves several transformations using a lag operator which serves to express equations (5.20) and (5.21) in terms of the current and lagged values of their independent variables.(11) The model after transformation is given as follows:

$$g_P = \alpha[\sum_{i=0}^{\infty} (1-\alpha)^i L^i (g_{P_T})_t]$$

$$+ (1-\alpha)\{[\sum_{i=0}^{\infty}(1-\alpha)^{i}L^{i} - \sum_{i=0}^{\infty}(1-\alpha)^{i}L^{i+1}][(DC/H)g_{DC} + g_{m} - g_{\hat{m}_d}]\} \quad (5.22)$$

$$(R/H)g_{R} = \alpha[\sum_{i=0}^{\infty}(1-\alpha)^{i}L^{i}(g_{P_T} + g_{\hat{m}_d} - (DC/H)g_{DC} - g_{m})_{t}] \quad (5.23)$$

where $\alpha = [1-\lambda(1-\beta)]^{-1}$

The transformed model which is given by equations (5.22) and (5.23) states that the price adjustment (the current rate of inflation) as well as the BOP adjustment (the current rate of change in foreign reserves) depend on the current and past values of world inflation and the EAEFSM.[12] The current and lagged values of these variables are polynomials, which are exponentially decreasing, and the weights are functions of the elasticity of relative prices with respect to the excess flow supply of money, λ, and the share of traded goods in the total expenditure, β.[13] Equation (5.22) expresses the domestic rate of inflation as a function of world inflation and the EAEFSM. All signs are expected to be positive. Equation (5.23) expresses the BOP as a function of the difference between the rates of change in real money demand plus world prices, $(g_{P_T} + g_{\hat{m}_d})$, and the rates of change in the money supply under the monetary authority's control, $[g_{m} + (DC/H)g_{DC}]$. When $[g_{m} + (DC/H)g_{D}]$ exceeds $(g_{P_T} + g_{\hat{m}_d})$ an adjustment in the BOP takes place. The sign of the coefficient of the difference is expected to be negative and equal to one.

The standard long run monetary approach can be looked at as a special case of the above model. If we assume that all goods are traded goods, so $\beta = 1$, then the coefficient of world inflation variable will be one. Therefore, equation (5.22) will be reduced to $g_{P} = g_{P_T}$ and

equation (5.23) will be equivalent to equation (5.11).

The estimation of equation (5.22) and equation (5.23) is carried through the construction of the polynomials and the assignment of weights to the first quarter lag of each exogenous variable. The weights which were used range from 0.2 to 0.9.(14) Thus, by varying the weights, different estimates of the coefficients α and $(1 - \alpha)$ are obtained. This process, in fact, implies assigning different values for λ for a given β. Then using the OLS estimation technique on different combinations of polynomials with the weight for the first quarter lag varying from 0.2 to 0.9, the estimation is carried out using both proxies of the world rate of inflation, the rates of change in WCPI and WWPI along with both definitions of money, M1 and M2. The regression equations which yield the highest R^2 are taken as the ones which represent the best estimates for α. Since $\alpha = [1-\lambda(1-\beta)]^{-1}$, the best estimate of α implies the best estimate of λ for a given value of β.

The combination of polynomials of world rate inflation, P_T, and the EAEFSM which maximizes R^2, using WWPI and the money M1, have first quarter lags of 0.9 and 0.6, respectively.(15) However, when the WCPI is used, the combination of the first quarter lags are found to be 0.8 and 0.4. When the broad definition of money, M2, is used, almost identical weights are obtained. The discussion of the empirical results is presented below.

The Estimates of the Domestic Inflation

The empirical results from the domestic inflation using equation (5.22) are presented in Table XII where the world rate of inflation is given by two measures (WWPI and WCPI). Using a one tail t-test, the

estimates of the coefficients of world inflation measured by world WWPI and the domestic monetary variable, EAEFSM, both are significant at the 5 percent level. However, when world inflation is measured by the world CPI (WCPI) none of the relevant variables are significantly different from zero. Whatever the measure of world inflation is used, the expected signs are obtained, where domestic inflation is positively related to the world rate of inflation as well as the EAEFSM. As far as the definition of money is concerned,, no significant change is achieved when using the broader definition. The results show that the explanatory power of the regression as indicated by the coefficient of determination, R^2, is very poor, especially when the WCPI is used to measure world inflation. At their best, when WWPI is used only 37 percent of the variation in domestic inflation is explained by the model specification.

The Durbin-Watson statistic identifies the absence of serial correlation among residuals when the WWPI is used. But, the use of the WCPI as a measure of world inflation indicated the presence of serial correlations, and the Cochrane-Orcutt iterative technique is utilized to account for the presence of the first order auto-correlation. The empirical results show that the adjustment process takes longer time (12 quarters) to complete when the world WWPI is used to measure world inflation. While the total adjustment to changes in domestic monetary conditions is completed in 8 quarters.(16) The somewhat better results obtained from using WWPI as a measure of world inflation may be due to the fact that WWPI includes a higher proportion of traded goods than the WCPI. This fact is reflected in the higher level of significance of the coefficients of world inflation, compared with the poor results from

TABLE XII

ESTIMATION OF THE PRICE ADJUSTMENT EQUATION
FOR SAUDI ARABIA: 1970-QII - 1982-QIV

$$g_P = \nu_0 + \nu_1 g_{P_T} + \nu_2 \Delta[g_m + (DC/H)g_{DC} - g_{\hat{m}_d}] + \mu$$

I. Using WWPI to measure world inflation
II. Using WCPI to measure world inflation

money	constant	g_{P_T}	$\Delta[g_m+(DC/H)g_{DC}- g_{\hat{m}_d}]$	$\bar{R}^2$	DW	rho	RMSE
I. M1	-0.073	5.443	0.032	0.314	1.65	--	0.034
	(-3.058	(4.305)	(2.231)				
II. M1	0.018	0.351	0.010	0.019	1.13	.427	.050
	(0.478)	(0.234)	(0.764)				
I. M2	-0.075	5.529	0.035	0.329	1.62	--	0.034
	(3.159)	(4.421)	(2.427)				
II. M2	0.018	0.365	0.015	0.038	1.11	.44	0.49
	(0.468)	(0.244)	(1.127)				

Notes:
- The dependent variable is the rate of domestic inflation in Saudi Arabia measured by the rate of change in CPI, 1975 = 100.
- The independent variables are the distributed lag polynomials of world inflation and the first difference of the EAEFSM.
- The weights of the first quarter lags for the inflation variable are 0.9 and 0.8 for WWPI and WCPI respectively. For the money variable the weights for the first quarter lags are 0.6 and 0.4 for WWPI and WCPI respectively
- Figures in parentheses are t-values.
- $\bar{R}^2$ is adjusted R^2. For regressions using WCPI the regular R_s^2 are reported since the adjusted ones were negative.
- D.W. is the Durbin-Watson statistic.
- Rho is the estimates of the first order auto-correlation obtain by the Cochrane-Orcutt technique.

using the WCPI measure. Finally, the empirical test using the Saudi Arabian data has failed to support the theoretical expectation that the sum of the estimated coefficients ($\hat{\nu}_1 + \hat{\nu}_2$) adds to unity.

The Estimates of the BOP

The empirical testing of the BOP equation (5.23) which specifies the BOP as a function of a polynomial of the difference between the ex ante excess flow supply of money, $[g_m - (DC/H)g_{DC} - g_{\hat{m}_d}]$ and world inflation, g_{P_T}, was done using the polynomial distributive lags (PDL) estimation technique. As in the case of testing the domestic inflation, a polynomial is constructed as a weighted average of current and past values of world inflation. Different weights for the first quarter lag were undertaken with the first quarter lag for EAEFSM variable ranging from 0.1 to 0.9 in the regression. The value of R^2 is maximized when a weight of 0.2 is given to the first quarter lag. This implies that a stock disequilibrium in the money market will create a flow process of adjustment which will take three quarters to complete. The empirical estimation has been performed using both measures of world inflation with both money definitions. The results from estimating the BOP equation (5.23) are shown in Table XIII.

Using a one tail t-test, the estimated coefficients are found to be statistically significant at the 5 percent level and to carry the expected negative sign. However, regressions using the WWPI-based inflation measure show slightly better results as indicated by the better statistics of R^2, DW and the t-ratios. This again gives support to the contention that the WWPI is a more proper measure for the prices of traded goods as compared with the CPI. The negative coefficients

TABLE XIII

ESTIMATON OF THE BOP ADJUSTMENT EQUATION
FOR SAUDI ARABIA: 1970-QII - 1982-QIV

$$(R/H)G_R = \delta_0 + \delta_1[g_{P_T} - (g_m + (DC/H)g_{DC} - g_{\hat{m}d})] + v$$

I. Using WWPI to measure world inflation
II. Using WCPI to measure world inflation

money def.	constant	$[g_{P_T} - (g_m + DC/H)g_{DC} - g_{\hat{m}d})]$	$\bar{R}^2$	DW	RMSE
I. M1	-0.032 (-1.572)	-1.0109 (-74.347)	0.992	2.17	0.1096
II. M1	-0.034 (-1.561)	-1.0108 (-69.418)	0.991	1.95	0.1174
I. M2	-0.030 (-1.427)	-1.0096 -72.316)	0.991	2.02	0.1127
II. M2	-0.032 (-1.409)	-1.0093 (-67.203)	0.99	1.84	0.1212

Notes:
- The dependent variable is the rate of change of net foreign assets holdings of SAMA, weighted by the share of this foreign component of base money.
- The independent variable is the distributed lag polynomial of the difference between the rate of world inflation and the rate of EAEFSM.. The weight of the first quarter lag used is 0.2.
- $\bar{R}^2$ is the R^2 adjusted for the degrees of freedom.
- D.W. is the Durbin-Watson Statistic.
- RMSE is the root mean square error.
- Figures in parentheses are t-values.

reflect the inverse relationship between the BOP (rate of foreign reserve accumulation) and the rate of change of domestic money supply $[g_m + (DC/H)g_{DC}]$ over the rates of change in demand for real money and world prices, $(g_{P_T} + g_{\hat{m}_d})$. In other words, the rate of foreign reserve accumulation varies inversely with the difference between the EAEFSM and world inflation. The result indicates that the quarterly movements in the Saudi data have shown an inverse one-to-one relation between the BOP and the EAEFSM, when world inflation replaced the domestic price level.

Some Remarks Concerning the Performance of the Model

The modified model is introduced in an attempt to explain how a domestic monetary policy expansion, i.e. expanding domestic credits, in a small open economy under fixed exchange rate, results in that country having a different inflation rate from the ROW. It presents a monetary model which aims to illustrate the nature of interaction between the BOP and the rate of domestic inflation in response to such monetary disturbance. The model provides a short run analysis of the impact of external influences as presented by the rate of world inflation and the BOP. The model is based on the assumption that, in the short run, as the small open economy expands its domestic money stock (the domestic money is the money under the control of the monetary authority) at a rate greater than that of the money demand, it will suffer a higher rate of inflation than the world rate. In brief, the model is concerned with the short run explanation of the prices and BOP adjustments in the face of a disequilibrium in the domestic money market. The adjustment process works via the goods, capital and money markets. When the

adjustment process is completed, domestic inflation will converge to the world rate, and the excess supply of money created ex ante by the monetary authority will be eliminated through the BOP. The testing of the modified model provides us with the following concluding remarks:

1) With respect to the influence on the rate of domestic inflation, both independent variables in equation (5.22), g_{P_T} and $\Delta[g_m + (DC/H)g_{DC} - g_{\hat{m}_d}$, are found to be important. But the t-statistics and the magnitude of the estimated coefficients indicate that the price variables play a more significant role than the domestic money in the determination of endogenous variable. The following general observation may be presented concerning the empirical findings on domestic inflation: a) Because the world WWPI contains a larger proportion of tradables than the WCPI, the coefficients of WWPI turn out to be superior to those of the WCPI as a measure of world inflation in terms of all statistical measures--higher level of significance, higher R^2, lower MSE and absence of serial correlation. b) The use of the broad definition of money, M2, gives slightly higher significance levels and slightly higher R^2s as compared with the results from using the narrow definition of money, M1. c) The theoretical presentation of the model expected the sum of the estimated coefficients $\alpha+(1-\alpha)$ to add up to unity. However, the empirical findings failed to meet such a condition.

2) With respect to the BOP as specified by equation (5.23), it is found that all coefficients are statistically significant even at the one percent level. When the WPI is used to measure the world rate of inflation the coefficient of the difference variable (the difference between the world rate of inflation and the rate of EAEFSM) carries a less significant level and a lower magnitude as compared with the WWPI

measure. Moreover, the adjustment process took three quarters to complete which is faster as compared with adjustment in inflation, which took a longer time span.

In general, the empirical findings indicate that world inflation explains the major part of variations in the rate of domestic inflation in Saudi Arabia, while the BOP had borne the major adjustments against the monetary disturbance in that country. Such findings, in fact, give support to the analysis proposed by this short run dynamic model.

Finally, some pitfalls in interpreting the regressions should be mentioned: (i) The regressions of domestic inflation as specified by equation (5.22) have shown consistent low values for the coefficients of determination. In fact the best R^2 obtained do not explain more than 37 percent. In contrast, the regressions of the BOP given by equation (5.23) have much larger R^2 values exceeding 99 percent in all cases. (ii) The definition of goods which are not integrated into the world economy, i.e., the non-traded goods, is not completely disintegrated from the traded ones, particularly for a small developing open economy as the Saudi economy. Although the non-traded goods do not enter international trade, however, a large proportion of their raw materials, or non-finished products, and labor factors are originated outside the national borders. (iii) The use of Saudi Arabia's CPI as a measure of the rate of domestic inflation, since no Saudi wholesale price index is in existence, must be taken with care. The small number of families, the basket of commodities included and the weights used in constructing the Saudi CPI are changing all the time. If one includes the time measure, all these factors may lower the accuracy of the CPI as a measure of world inflation. Therefore, the large magnitudes of

coefficients of world inflation when world WPI is used and the poor results obtained when world CPI is used as a measure for world inflation may be aggravated by the method of construction of the domestic CPI.

ENDNOTES

[1]The purchasing power parity, PPP, theory in its absolute form was presented by G. Cassel (1923). The theory indicated that national price levels are linked together via the exchange rate. I.e., given P_h/P_w = E, where P_h/P_w is the ratio of price level between countries, and E is the exchange rate, this implies that prices are identical in both countries when converted into a common currency unit. Thus, by implication, the buying power of both currencies are equal, because perfect abitrage of goods and capital markets is assumed. For example, suppose the price of corn expressed in a common currency is P_A^C = \$0.90/bushel in country A and P_B^C = \$1.20/bushel in country B, then the commodity arbitragers will start to buy corn in A's market, and sell it on B's market, accounting for transport costs. The arbitragers' activities will continue until the price of corn per bushel is equalized in the two countries. See Humphrey and Keleher (1982), p. 252 and Wilson (1986), p.210.

[2]Among the different studies that tested the integrated market hypothesis are the works of A. Hans Genberg (1976) and Bardo and Choudhri (1976). Genberg used the Swedish data and obtained results supportive of the integrated market hypothesis. Bardo and Chaudhri used Canadian data and rejected the integrated market hypothesis.

[3]Apart from the existence of non-traded goods, the price indices are affected by the weighting patterns used in the construction of each index. In the real world the weighting system is affected by the collection practice, timing, coverage, treatment of indirect taxes, etc. These differences will be reflected in the construction of the indices and will result in an unequal changes in the price indices across countries. See Genberg (1976), p. 299.

[4]The major trading partners are chosen according to their importance in each case country's foreign trade. Any trade partner

whose trade constitutes 3 percent or more of the country's total trade is included in the construction of the world rates of inflation. For the weights see Table IX in the text.

[5]The model which we are going to use in this study relies heavily on the model developed by Blejer (1977).

[6]This does not mean that the approach is not concerned with the stock variables, such as the level of international reserves for example, but it focuses its analysis on the stock adjustment. For more on this see Chapter III.

[7]The rates of change of nominal demand for money are rates of change of stock variables. However, since the rate of change of a stock variable is a flow, the BOP is said to be a function of "flow" excess supply of (demand for) money.

[8]A Walrasian price-based adjustment to excess demand is assumed here. However, an excess supply in the money market is used instead of excess demand in the goods market as the Walrasian adjustment postulates. See Blejer (1977) p. 421.

[9]The external sector in Saudi Arabia reflects three basic features. (i) The external payments position is almost entirely determined by developments on the current account. (ii) The overall payments balance shows the net balance between the net deficit non-oil sector and the net surplus of the oil sector. (iii) The net surplus of the oil sector accrues predominately to the government sector, while the net deficit of the non-oil sector originates in the private sector. See Hitti and Abed (1974) pp. 298-99.

[10]Direct estimation of equations (5.20) and (5.21), using the WWPI as a measure of the world inflation and the broad definition of money, M2, yielded the following:

a) The inflation equation:

$$g_P = \underset{(0.216)}{0.002} + \underset{(1.952)}{0.685 g_{P_T}} + \underset{(2.135)}{0.018 \Delta EAEFSM} + \underset{(2.399)}{0.323 g_{P_{-1}}}$$

$$\bar{R}^2 = 0.162 \quad h = -1.212 \quad rho = -0.055 \quad MSE = 0.001$$

b) The BOP equation:

$$(R/H)g_R = \underset{(0.578)}{-0.009} + \underset{(1.591)^T}{0.936}g_{P_T} + \underset{(5.343)}{0.084}\Delta EAEFSM + \underset{(1.760)^{-1}}{0.449}g_{P_{-1}}$$

$$+ \underset{(124.07)^m}{0.978}[g_{\hat{m}_d} - g_m - (DC/H)g_{DC}]$$

$$\bar{R}^2 = 0.99 \quad D.W. = 2.615 \quad rho = -0.324 \quad MSE = 0.005$$

Note that the BOP equation was corrected for serial correlation using the Cochrane-Orcutt technique for auto-correlations. This estimates are obtained using OLS. This direct estimation method, in fact, involves econometric problems, since the lagged endogenous variable of domestic inflation appears on the right hand side. Mario Blejer (1977) argues that the use of this direct estimation method is inferior to the indirect method which involves the transformation of the variables. See equations (5.22) and (5.23) in the text and Appendix B.

[11]The Lag operator for variable Z: $LZ_t = Z_{t-1}$ and $L^iZ_t = Z_{t-i}$. For more details see Appendix B.

[12]The ex ante excess flow supply of money is calculated by adding the rate of change of domestic credit creation to the rate of change of the money multiplier, and subtracting from this sum, the estimate of the rate of change of the real money demand. See Blejer (1977), p. 424.

[13]The previous condition remains valid. The lower is λ and the higher is β, the higher will be the coefficients of world inflation. The reverse is true for the coefficient of EAEFSM.

[14]For a variable Z where a first quarter lag weight of 0.6 is assigned, the polynomial will be generated as follows:

$$Z_t = (0.6)^0(0.4)Z_{t-0} + (0.6)^1(0.4)Z_{t-1} + (0.6)^2(0.4)Z_{t-2} + \ldots$$

However, when the next quarter lag term becomes so small that it will have almost no effect, a truncation is made. The truncation is done arbitrarily. The role is to include terms up to 0.01 or the twelfth quarter lag, whichever comes first.

[15]For example using equation (5.22), the R^2 which is obtained from regressing the domestic inflation in Saudi Arabia (measured by the CPI,

1975 = 100) on polynomials of current and past rates of world inflation (measured by the WWPI, 1975 = 100), and current and past rates of EAEFSM, are:

	Weights of the First Lag in the EAEFSM				
	0.2	0.3	0.4	0.6	0.8
0.3	0.114 (0.139)	0.122 (0.108)	0.125 (0.112)	0.073 (0.094)	0.027 (0.037)
0.4	0.131 (0.159)	0.143 (0.170)	0.149 (0.173)	0.083 (0.106)	0.032 (0.044)
0.6	0.182 (0.212)	0.202 (0.232)	0.220 (0.249)	0.216 (0.239)	0.063 (0.080)
0.8	0.278 (0.304)	0.299 (0.325)	0.323 (0.348)	0.357 (0.381)	0.325 (0.343)
0.9	0.329 (0.346)	0.341 (0.357)	0.353 (0.369)	0.370 (0.384)	0.370 (0.383)

The R^2 values on the top are obtained from regressions using the narrow definitions of money, M1, while the R^2 values between parentheses come from using M2. The maximum R^2 is obtained from the regression using a first quarter lag of 0.9 for WWPI and 0.6 for the EAEFSM.

[16]The weight for the first quarter lags for the polynomial of world inflation as measured by the WWPI is 0.9, while the weight for the EAEFSM is found to be 0.6. These results imply that the adjustment for the world inflation variable is completed in 12 quarters, while it takes 8 quarters for the adjustment of the monetary variable to complete. A similar pattern is found by Blejer for Mexico. See Blejer (1977). p. 424.

CHAPTER VI

CONCLUDING REMARKS

Summary

This study is an attempt to explore the determinants of foreign reserve flows in the oil-based small open economies of Libya, Kuwait and Saudi Arabia. The time span of the study encompasses the major oil price increases of the 1970s and 1980, which led to very large wealth and income (resource) transfers and provided a ready source of purchasing power to these developing economies. These oil reserve flows and the problem of the efficient recycling of such funds in the world economy had produced an adverse impact on all countries of the world. The wealth transfers lessened the financial constraints in these oil-based economies, but they resulted in more external and internal problems. Given the limited absorptive capacity to utilize these huge transfers of foreign exchanges by these developing economies, the sudden wealth contributed to the existing problems of higher inflation, more resource waste, income maldistribution, rapid depletion of oil reserves and sectoral imbalances. The oil-exporting economies of Libya, Kuwait and Saudi Arabia provide a good case of the small open economy under fixed exchange rates. Foreign trade plays an important role in almost all sectors of their domestic economies. Trade and exchange systems are relatively free from excessive direct government control, except in the

latter years in Libya. And fixed exchange rates have been applied for the entire period covered by this study.

The study examines the empirical validity of a simple monetary model of the foreign reserve flows (the BOP) under a fixed exchange rate regime using data from these oil-based small open economies. The BOP analysis provided by the "elasticities" and "income-absorption" approaches, which are known as the traditional approaches, was not considered suitable for analyzing the flow of foreign reserves of the oil-exporting countries. Given the situation of these oil-based economies, the "elasticities" approach is an inadequate tool of analysis because oil is highly price inelastic and paid for in foreign currency (the U.S. dollar). Meanwhile, the "income-absorption" approach, which depends on aggregate demand management, may have a limited impact, since the institutional and economic structures of these developing economies impose limits on their overall level of absorption Therefore, demand management is not the major problem as far as the LDCs are concerned.

The MABOP, which integrates the current and capital accounts into the money account of the BOP provides a better tool for the analysis of the reserve flows phenomenon in these oil-exporting economies. By defining the overall BOP or the money account as changes in net foreign reserves of the banking system, the MABOP views the BOP deficits or surpluses as stock adjustments to money market equilibrium. The MABOP theory asserts that foreign reserve flows can be explained by the changes in the variables which determine the demand and supply of money. Thus, it uses domestic monetary equilibrium conditions to derive an explanation to the overall BOP position of a country.

In this study the MABOP has been used as an analytical tool to

study the changes in net foreign reserves (the BOP) adjustment mechanism of the oil-based economies of Libya, Kuwait and Saudi Arabia. The approach utilizes the monetary forces in the domestic money market to derive a basic BOP equation that explains the monetary nature of the BOP. The model used is similar to the standard model which was presented by H. G. Johnson (1972), but it accounts for some of the institutional constraints imposed by the nature of these oil-exporting developing economies.

Two major modifications were introduced to the standard BOP model. The first modification dealt with the problem of reverse causation or feedback from the BOP to the domestic credit by treating the domestic credit endogenously. Hence, a reaction function was specified to explain the behavior of the monetary authorities in each country. Then both the BOP and the domestic credit equations were treated as a system and estimated simultaneously. The second modification dealt with the diversion of domestic inflation from its world counterpart. The price analysis relaxes the integrated market assumption and allows for the presence of the non-tradable sector using a short-run version of the standard monetary model. The modified model examines the dynamic adjustments in both prices and the BOP resulting from a domestic money disturbance. The econometric testing of all these relations was conducted using quarterly data covering.

In the empirical estimation of the reserve flow (the BOP) equations two methods were used: (i) The direct estimation method where the rates of change of the arguments of the demand for real money balances: $g_{m_d} = \varepsilon_y g_y + \varepsilon_{\pi_e} g_{\pi_e}$ were used directly in the estimation, as in equations (4.3) and (4.13), where ε_y and ε_{π_e} are elasticities of demand

for real money balances with respect to income and expected inflation. (ii) The indirect method which is done in two major steps: First, we estimated the demand for real money balances using a specified function, i.e. $(M^d/p) = f(y,\pi^e) + \mu$, in order to obtain the estimated values of demand for real money, $(\hat{M}/p)$. Secondly, this generated series of predicted real demand was transformed into growth terms and was substituted for g_{m^d} in the reserve flow equation. Then we proceeded with the estimation process as given by equations (4.9), (4.10) and (4.15). The empirical findings have already been outlined and discussed in details in Chapters IV and V. The general conclusions will be highlighted here.

Findings and Conclusions

This study has applied a monetary framework to interpret and to explain the past development of monetary relations in these oil-exporting developing economies. It is an empirical study using data from the case countries to test the validity of the long-run MABOP and a short-run version of that standard model to explain adjustments in prices and the BOP. The study aims to contribute in the construction of a framework for analyzing certain monetary relations and policies with its empirical evidence. The main findings can be summarized as follows:

First, with respect to the BOP adjustment analysis, this study found that the three countries support the relationships hypothesized by the monetary approach, especially the negative one-to-one correlation between the domestic credits and the BOP. The findings support the main claim of the monetary approach that an increase of the domestic credits component of base money at a rate faster (slower) than the rate of

growth of the demand for money will lead to a BOP deficit (surplus). The findings have shown that the movements in net domestic credits appear to be the most important explanatory variable of the BOP.

Concerning the performance of the money multiplier, the estimates of its coefficient in the BOP equations, whatever the money definition (narrow or wide) used, carry the right sign and statistically equal -1.0, except in the case of Libya. Since the Libyan reserve requirement ratio was unchanged, the finding suggests that the currency ratio might have been responsible to a great extent for the fluctuations in the money multiplier in Libya. However, the high correlation between the rates of change in the money multiplier and the net domestic credit suggests that the money multipliers have been influenced by the credit policies as well. Thus, it reduces the validity of treating the money multiplier as an exogenous variable in the BOP equation.

The signs of the other explanatory variables in the BOP equations were all as predicted by the monetary approach theory. However, their magnitudes failed to meet their theoretical expectations especially for the real income variable. The direct estimation of the BOP models in all cases shows that the coefficients of the rates of change in price are positive and statistically equal to unity with the exception of the simultaneous estimation in the Saudi case using the 2SLS technique. The real income variable carries the expected positive sign in most of the regressions, however, in all cases it is statistically not significantly different from zero. The coefficient of the expected inflation variable carries the correct negative sign, but it is statistically not significantly different from zero in all cases.

The results also suggest that a simultaneous estimation, which

accounts for the feedback effect from the BOP to the domestic credits via separate specification of a domestic credits equation or reaction function into the model, provided better estimates than the single equation estimates of the BOP (compare Tables III and V with VII and VIII). The improvements in the simultaneous estimation may be due to taking account of interdependence between changes in net domestic credits and the BOP which led to the reverse causation between these two major components of the monetary base. The feedback effect was present between the two variables as indicated by the estimate of the reaction function (see Table IX). The BOP estimation technique which takes the feedback effect into account, in fact, supported the one-to-one inverse relation between the domestic credits and the BOP, which the single equation estimation failed to support in Libya and Saudi Arabia when the interdependence was not counted for. In general, the empirical evidence on the BOP estimation provides the following major conclusions: (i) The estimated models do explain a substantial portion of the variation in the BOP as indicated by the relatively high $\bar{R}^2$ and significant F-statistics; (ii) the indirect method of estimation gives better results than the direct method which can be observed by comparing Tables III with VII and Tables V with VIII; (iii) the poor performance of the direct estimation of the BOP may be due to the presence of multi-colinearity between the rates of changes of prices and the inflation expectation; (iv) all the results do support the monetary approach claim that prices and real income increases will improve the BOP position of a country; (v) all results supports the claim that increases in the growth rates of the net domestic credits and/or the expected inflation and/or the money multiplier worsen the BOP position of the country concerned;

(vi) the results support the monetary nature of the BOP, where an excess supply of (demand for) money implies a BOP deficits (surpluses) as shown in Tables V, VI and VIII: and (vii) in the case of Kuwait a significant negative one-to-one relation between net domestic credits and the BOP was found when the former is considered exogenously determined. However, in the case of Libya and Saudi Arabia the significant negative one-to-one relation between the two variables was found only when the net domestic credit variable is treated endogenously.

Second, with respect to the reaction function, to account for the feedback effect from the BOP to the net domestic credit, the domestic money component (domestic credits) is treated endogenously. To test for such a feedback, a separate specification of a domestic credits equation (reaction function) is required to show the determinants of domestic credit. The empirical findings from estimating the domestic credits equation (reaction function) are presented in Table IX in the text. The findings suggest that the monetary authorities of the oil-exporting small open economies of Libya, Kuwait and Saudi Arabia have been actively sterilizing the effects of foreign reserve flows in favor of maintaining a stable monetary base and total money supply. This fact is indicated by the high magnitude of the estimated coefficient of changes in net foreign reserves with respect to changes in net domestic credits, $\partial g_{DC}/\partial g_{R}$. The results (as shown by Table IX) imply that sterilization is complete in Saudi Arabia and nearly complete in Kuwait and Libya. But, given the ad hoc specification of the reaction function, an alternative specification of this function may provide a more consistent and better explanation of sterilization and credit policies.

Third, with respect to inflation, in the estimated demand for money equation, a specification of inflation expectation was used as a proxy for the cost of holding inactive money balances. The results from the estimates of the demand for money (as shown by Table IV) found that expected inflation was an unimportant determinant of the public's demand for real money balances.

The MABOP's assumption concerning the purchasing power parity, PPP, was tested as well using its relative version. As shown by Table XI, the PPP assumption held strongly in Kuwait, weakly in Libya and failed to hold for the Saudi case. Therefore, a domestic inflation equation was specified as a part of an adjustment process in the face of monetary disturbance. Domestic inflation is specified as a function of world inflation and a measure of ex ante excess flow supply of money. This is done by extending the standard model of the MABOP to allow for the role played by the non-tradables sector in the adjustment process of imbalances in the domestic money market. A short-run dynamic model developed by M. Blejer (1977) was adopted and applied to the Saudi data. The results from the short-run dynamic adjustment which allows prices to share in the adjustment process with BOP are given in Tables XII and XIII. The results of the estimation of the domestic inflation equation (see Table XII) support the monetary analysis on the short-run price adjustment. However, the regression has a low coefficient of determination, R^2, and indicates that world inflation is, in fact, the major determinant of the domestic inflation, in spite of the statistical significance of the monetary variable. Meanwhile, the empirical findings from the BOP equation (see Table XIII) showed a one-to-one inverse relation between the BOP and a measure of the ex ante excess

flow supply of money, EAEFSM, in which world prices replaced the domestic price level variable used in the standard model. Thus, one may conclude that the Saudi data reported findings in support of the assumption that it is possible for a small open economy with fixed exchange rates to experience a rate of inflation different from that of the world inflation. Also, both BOP and domestic inflation estimates are found to depend on world inflation as well as the excess flow supply of money.

Finally, the results obtained from applying the same models to each case country do show some differences due to the institutional and structural dissimilarities among these oil-based economies. However, as far as the empirical findings are concerned, all models estimated, whatever the estimation technique and money definition used, provided the following major conclusions:

a) In all the BOP models tested the most significant explanatory variable appears to be the movement in net domestic credits.

b) Sterilization policies were exercised by the monetary authorities in the three countries. In fact, sterilization was complete in Saudi Arabia and nearly complete in Libya and Kuwait. However, due to the ad hoc specification of the reaction function, the interpretation about sterilization should be viewed more as speculation than as a firm conclusion.

c) It is possible for a small open economy under fixed exchange rates to experience a rate of domestic inflation different from that of the world rate of inflation.

Some Policy Implications

The variation in the performance of the models used in the empirical testing in these oil-based small open economies is found to be very small, which supports the assumption of close similarities among these economies. Despite such close similarities, one may say that it is not possible to develop a single model that works satisfactorily and generates appropriate policy options for these small open economies, let alone adopt models which are basically constructed for the developed economies. Therefore, for the models to be useful for practical policy formulation, the models should be modified to account for, as accurately as possible, the specific economic and political realities of any country they intend to present. Hence, some of the following policy suggestions and implications should be taken into account:

1. The application of the foreign reserves flow (the BOP) equations suggests that an inappropriate monetary policy in a country can lead to undesirable consequences for that country's economy and its BOP. For example, the results imply that an expansionary monetary or credit policy that leads to a money creation at a rate faster than the rate of increase in demand for real cash balances tends to generate a reserve loss, and the reverse is true. But, according to the monetary approach theory, such deficit (or surplus) is of a transitory nature and if the discrepancy is kept constant, it will eventually disappear through the BOP automatic adjustment mechanism. Therefore, for these oil-based developing economies, to generate foreign reserves flow, aside from their oil sectors, they either enforce a policy which increases productivity and output or restrains the expansion of their domestic money stock. These two policy options may be explained as follows:

(i) A policy option which is available via the mobilization of their idle resources in an effort to increase the total output accompanied with a plan to raise the productivity of the domestic economy; these efforts are long-run policy measures. (ii) The alternative policy option is to pursue an expansionary monetary policy, which may cause output to grow and reverse the loss of foreign reserves by increasing the money demand. Besides, an expansionary monetary policy may generate inflation which serves to increase the nominal money demand and to reduce the real money supply.

2. Devaluation is an important instrument of monetary policy for BOP adjustment. G. Bird (1978) argues that devaluation tends to reduce the foreign reserves loss and help generate a BOP surplus, by switching expenditure toward domestic output. In fact, in the LDCs the unemployed resources can be utilized to increase the domestic output needed to replace the cut in imports. The low integration of the LDCs with the rest of the world makes devaluation a more preferred candidate as a policy option. However, the poor resource base, in our oil-based developing economies, limits the availability of import substitutes. These economies are highly dependent on imports for most of their needs (finished and unfinished products, as well as all type of capital goods), while their oil exports are paid for in dollars (not the national currencies). These factors put limits on the importance of devaluation as a policy option available to these economies.

3. There are two ways to curb the monetary impact of an increase in foreign exchange receipts. One way is to use all the increase in foreign reserves to import more goods and services from the rest of the world. The other way is to build higher reserves of foreign exchange,

which is a sterilization policy. In fact, our oil-rich economies are more concerned with achieving the internal goals of their economic plans than maintaining a stable BOP. Therefore, they supply liquidity and manage credits in order to serve the economic activities as outlined in the economic plans. In other words, the government pursued an active sterilization policy as indicated by the empirical results. Such policy of negating or neutralizing the impact of foreign reserve flows on the base money needs to continue, and can be achieved, if the authorities in these developing countries take into account the absorptive capacity of the economy at the time of setting the goals of each economic plan.

Points for Future Research

In general, the results obtained from the estimation of the various models in this study appear to be reasonably good. However, our understanding could be improved by future research on some of the following points:

1 - More research needs to be done and on a detailed analysis of the determinants of the money multiplier in these countries.

2 - The study of the money demand and the reserve flow equations could be improved if a proper set of quarterly interest rate data is found; or, if a wealth variable is used in the demand for money. Concerning the reserve flow equation, the interest rate parity was assumed to hold since the assumption is not verifiable from the existing data on interest rates in these countries.

3 - The short-run dynamic analysis of the prices and BOP based on the framework of the monetary approach as presented by Blejer (1977) and Parkin (1974) assumed real output was independent of the money

supply. The full employment assumption could be relaxed for a more reasonable assumption for these developing economies. Therefore, real output can be incorporated as an endogenous variable which responds directly to changes in the money supply. Bruno (1979), Taylor (1979) and Cavallo (1981) are examples of studies which emphasized strong real output effects of domestic credits, particularly in LDCs. M. Khan (1977) presents a model which allows fluctuations in real income and/or inflation to characterize the path towards the long-run equilibrium.

4 - A more detailed monetary sector model for an open economy under either fixed or "managed floating" exchange rate regimes which takes into account the output side may be able to better explain the BOP problem in these developing economies.

5 - An alternative analysis may be found in a modern version of the income-expenditure theory, known as "the fiscal approach to the BOP," which includes the government budget in the analysis of the BOP. It accounts for the effect of the government budget in the specification of the BOP. In this analysis, the government budget can be assumed exogenous, and only the private sector BOP acts as an adjustment to money disturbance. This alternative analysis may present an improvement to the monetary analysis to the BOP. [For more exposition concerning the "fiscal approach", the works of J. A. Bispham (1975), R. I. McKinnon (1976), and R. T. Stillson (1976) may be consulted].

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APPENDICES

APPENDIX A

THE TECHNIQUE USED TO GENERATE QUARTERLY FIGURES FROM ANNUAL FIGURES AND EXPECTATIONS AND DATA SOURCES

A.1 The Interpolation Technique Used to Generate Quarterly Income From The Annual Figures

The quarterly income data are not available for the three case countries. Thus, Diz's (1970) technique was used to obtain quarterly data from the corresponding annual series. The technique used requires that the quarterly sum for each year must add up to four times the annual figure. According to this interpolation technique the quarterly series are generated as follows:

$$X_{it} = (4Z_t/\Sigma Q_i)\cdot Q_i \qquad i = 1,2,3,4$$

where:

$$Q_1 = Z_{t-1} + (7.5/12)(Z_t - Z_{t-1})$$

$$Q_2 = Z_{t-1} + (10.5/12)(Z_t - Z_{t-1})$$

$$Q_3 = Z_t + (1.5/12)(Z_{t+1} - Z_t)$$

$$Q_4 = Z_t + (4.5/12)(Z_{t+1} - Z_t)$$

Z = annual income in the current year.

Z_{t-1} = annual income in the previous year.

Z_{t+1} = annual income in the next year.

X_{it} = the quarterly figures of the current year.

This interpolation technique uses up the first and the last observations of the annual series, resulting in a shorter quarterly sample period.

A.2 The Generation of Inflationary Expectations

The inflationary expectations (π^e) variable is directly unobservable. Thus, to obtain a series of expected inflation, an adaptive expectation of the following specification is used:

$$\Delta\pi^{e}_{t} = \lambda(\pi_{t} - \pi^{e}_{t-1}), \qquad 0 < \lambda < 1$$

The criterion for choosing the value of λ is the minimum S.E. of regression. Several values of the adjustment coefficient (λ) have been tried. The one reported has $\alpha = 0.9$ for Saudi Arabia, and $\alpha = 0.8$ for both Libya and Kuwait. For example, an adjustment coefficient of 0.9 implies that for a variable Z, its expected value $Z^{e} = 0.9Z_{t} + 0.09Z_{t-1} + 0.009Z_{t-2}$. However, a rule of truncation is applied to disregard terms which are considered too small to have any meaningful effect in the estimation.

A.3 Sources of Data

The data used are obtained from three major sources:

(i) Central Bank of Libya (CBOL), Saudi Arabian Monetary Agency (SAMA) and publications of the Libyan Secretary of Planning.

(ii) International Financial Statistics of the IMF and the World Bank World Atlas and its World Development Reports.

(iii) The United Nations Yearbook of National Accounts Statistics and its Statistical Yearbook.

APPENDIX B

DERIVATION OF THE PRICE AND BOP EQUATIONS IN BLEJER'S MODEL

The Model

$$(M^d/P) = f(y,\pi^e) \tag{1}$$

$$G_{M^d} = g_P + g_{m^d} \tag{2}$$

$$M^s = m \cdot H = m \cdot (DC + R) \tag{3}$$

$$g_{M^s} = g_m + (DC/H)g_{DC} + (H/R)g_R \tag{4}$$

$$g_P = \beta g_{P_T} + (1 - \beta)g_{P_{NT}} \tag{5}$$

$$G = [(DC/H)g_{DC} + g_m] - (g_P - g_{m^d}) \tag{6}$$

$$P_{N_T}/P_T = ke^{\lambda G} \tag{7}$$

$$g_{P_{NT}} - g_{P_T} = \lambda(\Delta G) \tag{8}$$

$$g_{M^s} = g_{M^d} \tag{9}$$

For simplicity denote (R/H) = k, then (DC/H) = (1-k). Then substitute the terms (2) and (4) for equation (9) we obtain:

$$g_m + (1 - k)g_{DC} + (k)g_R = g_P + g_{m^d} \tag{10}$$

Solving (10) for g_P and g_R in terms of their exogenous variables and lagged endogenous variables produces equations (5.20), (5.21), (5.22) and (5.23) of the main text, which are the price and BOP adjustments.

The Derivation of the Domestic Rate of Inflation Equations

(a) From equation (7) and by substitution, we obtain:

$$g_{P_{NT}} = g_{P_T} + \lambda\Delta G$$

$$= g_{P_T} + \lambda\Delta[(1 - k)g_{DC} + g_m - (g_P - g_{m_d})]$$

From (5) and (8), by substitution we obtain:

$$g_P = \beta g_{P_T} + (1 - \beta)[g_{P_T} + \lambda(\Delta G)]$$

$$= g_{P_T} + (1 - \beta)\lambda\Delta G$$

$$= g_{P_T} = (1 - \beta)\lambda\Delta[(1 - k)g_{DC} + g_m - g_P - g_{m_d}]$$

$$= g_{P_T} + (1 - \beta)\lambda\Delta[(1 - k)g_{DC} + g_m - g_{m_d}] - (1 - \beta)\lambda\Delta g_P$$

$$= g_{P_T} + (1 - \beta)\lambda\Delta[(1 - k)g_{DC} + g_m - g_{m_d}] - \lambda(1 - \beta)g_P$$

$$+ (1 - \beta)\lambda g_{P_{-1}}$$

$$(1 + \lambda + \lambda\beta)g_P = g_{P_T} + (1 - \beta)\lambda\Delta Q + (1 - \beta)\lambda g_{P_{-1}}$$

Thus:

$$g_P = \alpha g_{P_T} + (1 - \alpha)\lambda\Delta Q + (1 - \alpha)\lambda g_{P_{-1}} \qquad \text{I}$$

where:

$$Q = [(1 - k)g_{DC} + g_m - g_{m_d}]$$

$$\alpha = [1 + \lambda - \lambda\beta]^{-1}$$

(b) To obtain the domestic price equation (5.22) in the text, we need to solve recursively for $g_{P_{-1}}$:

$$g_P = \alpha g_{P_T} + (1-\alpha)\Delta Q + (1-\alpha)g_{P_{-1}}$$

$$(1-\alpha)g_{P_{-1}} = \alpha(1-\alpha)g_{P_{T_{-1}}} + (1-\alpha)(1-\alpha)\Delta Q_{-1} + (1-\beta)(1-\beta)g_{P_{-2}}$$

$$(1-\alpha)^2 g_{P_{-1}} = \alpha(1-\alpha)^2 g_{P_{T_{-2}}} + (1-\alpha)^3\Delta Q_{-2} + (1-\alpha)^3 g_{P_{-3}}$$

$$\vdots$$

$$(1-\alpha)^i g_{P_{-i}} = \alpha(1-\alpha)^i g_{P_{T_{-i}}} + (1-\alpha)(1-\alpha)^i\Delta Q_{-i} + (1-\alpha)^i g_{P_{-i}}$$

Note, as $i \to \infty$, the last term $\to 0$. So, g_P is the summation of all the above terms:

$$g_P = \alpha g_{P_T} + \alpha(1 - \alpha)g_{P_{T-1}} + \ldots + \alpha (1-\alpha)^i g_{P_{T-i}}$$

$$+ (1-\alpha)(1-\alpha)\Delta Q + \ldots + (1-\alpha)(1-\alpha)^i \Delta Q + 0$$

Now, using lag operator: $L(X_t) = X_{t-1}$ and $L^e(X_t) = X_{t-e}$. Therefore, the domestic inflation equation can be written as:

$$g_P = \alpha \sum_{i=0}^{\infty} (1-\alpha)^i L^i (g_{P_T}) + (1-\alpha)\{[\sum_{i=0}^{\infty} (1-\alpha)^i L^i$$

$$- \sum_{i=0}^{\infty} (1-\alpha)^i L^{i+1}]Q\} \qquad \text{II}$$

where Q and α as defined above.

Solving for the BOP Equations

(a) From the equilibrium condition of equation (8), we obtain:

$$kg_R = g_P + [g_{m_d} - (1 - k)g_{DC} - g_m]$$

Substituting for g_P from result I, we obtain:

$$kg_R = \alpha g_{P_T} + (1-\alpha)\Delta Q + (1-\alpha)\lambda g_{P_{-1}} - Q \qquad \text{III}$$

where Q as defined above.

(b) To obtain the BOP Equation (5.23), we solve recursively for the lagged endogenous variable $g_{P_{-1}}$:

$$kg_R = \alpha g_{P_T} + (1-\alpha)\Delta Q + (1-\alpha)g_{P_{-1}} - Q$$

$$= \alpha g_{P_T} + (1-\alpha)Q - (1-\alpha)Q_{-1} - Q + (1-\alpha)g_{P_{-1}}$$

$$= \alpha g_{P_T} - \alpha Q - (1-\alpha)Q_{-1} + (1-\alpha)g_{P_{-1}}$$

Now, substituting for $(1-\alpha)g_{P_{-1}}$:

$$kg_R = \alpha g_{P_T} - \alpha Q - (1-\alpha)Q_{-1} + \alpha(1-\alpha)(g_{P_T})_{-1} +$$

$$(1-\alpha)^2\Delta Q_{-1} + (1-\alpha)^2 g_{P_{-2}}$$

$$= \alpha g_{P_T} + \alpha(1-\alpha)(g_{P_T})_{-1} - \alpha Q - \alpha(1-\alpha)Q_{-1} + (1-\alpha)^2 g_{P_{-2}}$$

$$\vdots$$

$$= \alpha g_{P_T} + \alpha(1-\alpha)(g_{P_T})_{-1} + \ldots + \alpha(1-\alpha)^i(g_{P_T})_{-i} -$$

$$\alpha Q - \alpha(1-\alpha)Q_{-1} + \ldots + \alpha(1-\alpha)^i Q_{-i} + 0$$

Using the lag operator, we obtain:

$$kg_R = \alpha \sum_{i=0}^{\infty} (1-\alpha)^i L^i (g_{P_T}) + \alpha \sum_{i=0}^{\infty} (1-\alpha)^i L^i (-Q)$$

$$= \alpha \sum_{i=0}^{\infty} (1-\alpha)^i L^i [(g_{P_T}) - (Q)]$$

Thus:

$$kg_R = \alpha \sum_{i=0}^{\infty} (1-\alpha)^i [g_{P_T} + g_{m_d} - (1 - k)g_{DC} - g_m] \qquad \text{IV}$$

where $\alpha = [1 + \lambda - \lambda\beta]^{-1}$

VITA

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Candidate for the Degree of

Doctor of Philosophy

Thesis: THE MONETARY APPROACH TO THE BALANCE OF PAYMENTS: THE CASE OF THE OIL-BASED, SMALL, OPEN, DEVELOPING ECONOMIES OF LIBYA, KUWAIT AND SAUDI ARABIA

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Personal Data: Born in Benghazi, Libya, December 15, 1939, the son of Al-faquih Ramadan Khalil Buzakuk and Mukhaterha Abdulrahman.

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