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IN THE NAME OF ALLAH
THE MERCIFUL
THE MERCY GIVING

O ALLAH , MY LORD
GRANT ME INCREASE IN KNOWLEDGE

(*Al Qur'an, Surah 20 Thaha 114*)

**ASPECTS OF
BALANCE OF PAYMENTS MODELLING
IN A DEVELOPING ECONOMY :
A CASE STUDY OF INDONESIA**

by
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Doctoral Dissertation

**Submitted in partial fulfilment of the requirements
for the award of Doctor of Philosophy (DPhil)
of the Loughborough University of Technology (LUT)
School of Human and Environmental Science
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ABSTRACT

ASPECTS OF BALANCE OF PAYMENTS MODELLING IN A DEVELOPING ECONOMY A CASE STUDY OF INDONESIA

This study examines the Elasticities, Absorption, Monetary, Capital Market and the Structural Approaches to the Balance of Payments in the context of Indonesia's international transactions for 1960-1988. The main findings are :

- The necessary condition of the Marshall-Lerner is not satisfied in the SR , it is fulfilled in the LR but only just ! However, the sufficient condition shows that in the SR, the trade balance ameliorates but deteriorates in the LR, a reverse "J-curve" effect !
- The "pass-through" equation reveals that exchange rate, import price, money supply and lagged domestic price are significant in explaining domestic price responses. The significance of the pass through coefficient reveals that it is difficult to sustain price levels due to devaluation; inflationary effects counteract the price advantages following devaluations.
- The Absorption model shows that the magnitude of the coefficient of MPA is relatively high indicating that the economy has been absorbing more than it produces.
- The Reserve model reveals that the assumption of homogeneity in prices can not be rejected; the restricted specifications are superior to the unrestricted ones. The major prediction of the monetary theory that the offset coefficient should be negative appears to be verified in most cases.

- The results of the Capital model were that political chaos, change in government regime, high inflationary economy, fiscal deficits, the fear of devaluation and high world interest rate were the primary causes of capital flight, whilst capital inflows were associated with high domestic interest rates.

- There was not much efficiency difference among various estimation procedures; the results of the single-equation estimations are relatively similar to those of the simultaneous procedures. The parameter vectors of the models have been subject to some instability over the sample period; this might be caused by the fact that the economy has been subject to changes in the structure of assets and the goods market after the 1965 revolution.

- The Reserve and the Capital models are less robust compared to the Elasticities and the Absorption in terms of theoretical signs, goodness of fit, and the significance of coefficients. The Elasticities and the Absorption models yield more accurate forecasts. The Bayesian Discrimination and the Forecasting statistics support the hypothesis that the Elasticities and the Absorption models outperform for forecasting purposes, however, since each model analyses different elements of the balance of payments, they can be used as complementary rather than competitive for policy purposes.

- A synthesis of the results would indicate that persistent balance of payments disequilibrium can be seen as a structural problem. The payment difficulties originate from the supply side and non-price factors for which devaluation is not only the appropriate response.

DECLARATION

This thesis is a record of research work carried out by the author in the School of Human and Environmental Science, L'borough University of Technology, LE113TU, Leicestershire, England. It represents the independent work of the author; the work of others has been referenced where appropriate.

The author also certifies that neither this thesis nor the original work contained herein has been submitted to any other institution for a degree.

Binsardisastrowardojo A.P.

D E D I C A T I O N

**the memory of beloved father
DR. SARDI BINHARTADI**

**mother
NUNGKY SARDI**

**teacher's teacher
HASTOETI HARSONO, MOHAMAD SALEH, HARRY SUSANTO
JUMILAH Z, UMAR BURHAN, SURADI MW, SUDAMAR HW
BERLIAN GANI, MURYATI, PURWANTINI
UBUD SALIM, HARTOKO MD, ALEX
RUSDI HENDRA, SURADI PUTRO**

**friends, brothers and sisters
MARIA, PRIMI, HARRY, RENA, DIMAS
HASTI, WIDODO, NISI, YUDI, LUCY**

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**A person who does not thank people does not thank Allah swt
(Al Hadith)**

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CHAPTER 1

INTRODUCTION

This study examines a number of current, capital and overall account models of the balance of payments (the Elasticities Approach, the Absorption Approach, the Monetary Approach, Capital Market Approach, and the Structural Approach to the Balance of Payments) in the context of Indonesia's international transactions for 1960-1988. This study has three features which distinguish it from others. First, it employs both partial and general equilibrium analyses in examining the balance of payments problems. A partial equilibrium model such as the Elasticities or the Absorption model will be employed particularly to analyze the good markets of the balance of payments, while general equilibrium model such as the Reserve or the Capital model is utilized to focus more on the money and asset markets of the balance of payments. Second, this study compares and contrasts four theoretical approaches by analyzing the balance of payments, i.e, the Elasticities Approach to the Balance of Payments (EABP), the Absorption Approaches to the Balance of Payments (AABP), the Monetary Approaches to the Balances of Payments (MABP), the Capital Market Approach to the Balance of Payments (CMABP), and the Structural Approach to the Balance of Payments (SABP). While most empirical studies concentrate on only one approach (chapter 4), this study will employ four approaches collectively in analyzing the balance of payments. Third, it is a specific case study for the Indonesian economy for which limited similar works have been conducted. It seeks to add therefore to the existing applied balance of payments analysis in a developing country context.

1.1. The Purpose of the Study

In order to formulate macropolicies for remedying balance of payments problems, it is important to know the nature of the balance of payments behaviour in the economy. Unfortunately there is no consensus among economists as to a single balance of payments model that should be employed to investigate the balance of payments behaviour in general and in developing countries in particular.

Empirical evaluation of a hypothesis can bridge the gap between the real world and the world of theories. According to scientific methods, the validity of any hypothesis should be tested by empirical evidence ¹. Since most theoretical and empirical work on the balance of payments concentrates on the developed countries, their relevance is questioned for less developed economies. Moreover there has been little effort to test the validity of the balance of payments theories for less developed countries, and particularly for the Indonesian economy. Although there are qualitative as well as quantitative differences between these two groups of countries, with some modification and careful interpretation of empirical results the theories of developed economies may be applicable to the less developed countries ².

The main objective of this study is to examine empirically the various balance of payments models for the Indonesian economy employing annual data for the period of 1960-1988. The specific objectives are, first, to gain a better understanding of the main determinants of the Indonesian balance of payments for the period of *Orde Baru* (1967 up to the present time),

¹However Friedman (1953) argues that empirical evidence can reject a hypothesis but it cannot prove its validity.

²On the same line Myint (1965) argues that what is needed is not a "new theory" but a careful selection of assumption and a different emphasis on the various elements of "Western" theories. This may call for a long sequence of experiments before a satisfactory framework is available.

second, to access and compare empirically estimations of the various balance of payments approaches to Indonesian data in particularly to determine which model or under which circumstance a particular model is "more suitable" for analytical purposes, third, to identify how changes in macropolicies and other factors have affected the behaviour of the balance of payments in the economy, and finally, to draw appropriate fiscal and monetary policies conclusions to correct the balance of payments difficulties in the future.

1.2. Organization of the Study

This study is divided into eight chapters. Chapter 1 explains the direction, aim and a brief methodology of the thesis. Chapter 2 describes the Indonesian balance of payments in historical perspective. The discussion concerns the balance of payments statistics from 1960 up to the present time, under the period of *Orde Baru*. It also discusses important events and macro economic policies related to the balance of payments during the sample period. Chapter 3 provides an assessment and comparison of four theoretical approaches to the balance of payments namely the Elasticities, the Absorption, the Monetary, the Capital Market and the Strutural Approaches to the Balance of Payments. Chapter 4 surveys the existing evidence from empirical studies. It is concerned with the testing of these theories. Thus chapter 3 and 4 can be viewed as a basis for the model formulation and testing set out in chapter 6 and 7. Chapter 5 describes data sources used in statistical estimation. The limitations and problems of the data, proxy variables, symbols, and definitions are also presented. Chapter 6 discusses the specifications of each balance of payment model and the individual estimates of the balance of payments theories. It also identifies how changes to economic variables separately affected the balance of

payments. The focus is on the goodness of fit of the balance of payments model individually as shown by its statistical performances and diagnostic tests. In contrast to chapter 6, chapter 7 compares empirically the balance of payments models in a pairwise fashion (not individually) and discusses alternative macropolicy implications of the estimated models for the period of *Orde Baru*, 1967-1988. It provides insight into the relative strengths and complementarity of different models by comparing and reconciling all models. Finally chapter 8 presents a summary of the empirical findings and policy implications.

CHAPTER 2

THE INDONESIAN BALANCE OF PAYMENTS

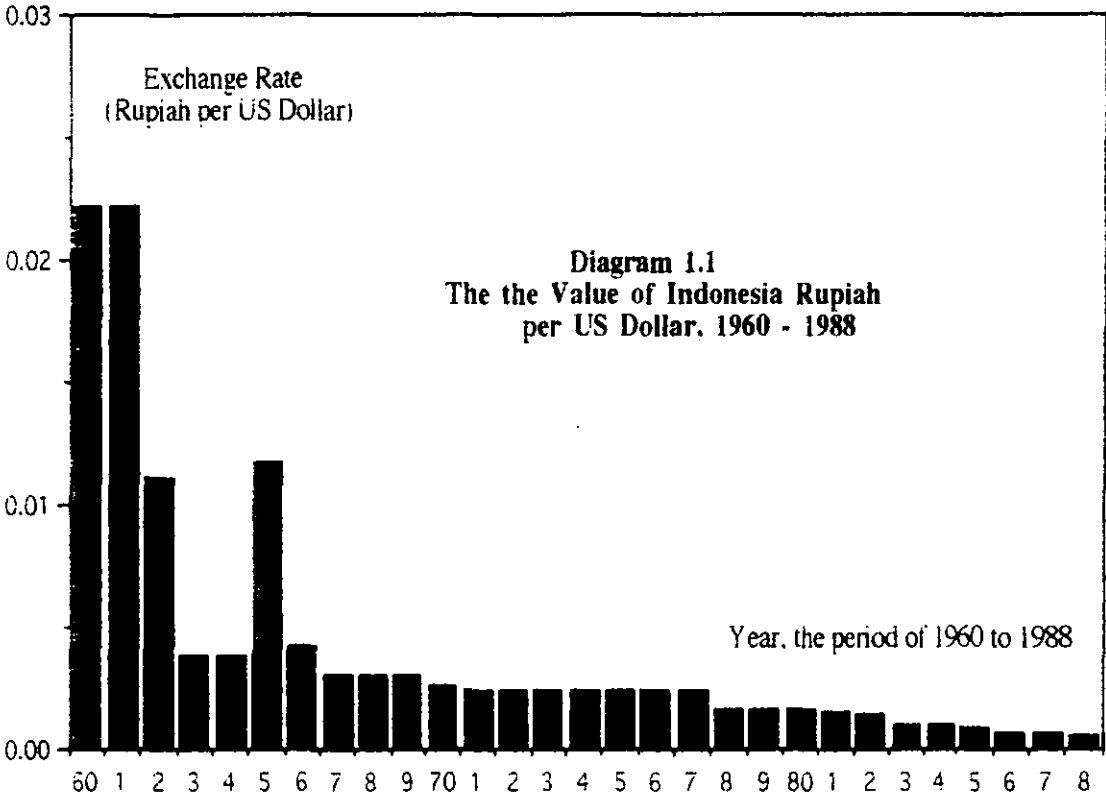
Indonesia has experienced recurring balance of payments problems during the Suharto era. The rupiah currency has lost value at an average annual rate of more than 35% due to the successive devaluations ¹ in the period of *Orde Baru*. (graph 2.1). The primary purpose of this chapter is to analyse the balance of payments experience of Indonesia particularly during the period of *Orde Baru*². It places the experience in a historical perspective, relying on the statistical data compiled by the Bank of Indonesia (BI), the Central Statistical Bureau of Indonesia (BPS), and the International Monetary Fund (IMF). Throughout the chapter, emphasis will be given to the discussions of Indonesia's macroeconomic trends and its outstanding developments, particularly the setting of Indonesia's exchange-rate policy to attain the balance of payments equilibrium. The study also seeks to investigate the effectiveness of successive devaluations, whether Indonesia's persistent balance of payments difficulties are mainly a function of adverse relative price movements which can be rectified only by adjustments to the exchange rate. In

¹Devaluation policy, rather than trade-restriction policy has been conventionally used in the economy since the Technocrats control the ministry that oversee macroeconomic policy but not the Ministry of Trade which has authority over trade restrictions. The Technocrats are neo-classical economists who lend support to the "comparative advantage" hypothesis. Accordingly their policy recommendation is in favour with President Suharto hence their concern for raising low-income people and for maintaining equitable distribution.

²*Orde Baru* or New Order is the period from 1966 until the present time during which General Suharto has been in power. He took over power from the Communist Party in the 1965 revolution.

particular it questions the relevance of conventional adjustment mechanism as a solution to Indonesia's weak balance of payments. This study endeavours to contribute to macropolicy evaluation in Indonesia during Suharto's era.

Graph 2.1
The Value of Indonesian Rupiah per US Dollars 1960-1988



The behaviour of the Indonesian exchange rate in 1960-1988 may be classified by three different periods. The first period 1960-1965 was marked by an administrated multiple exchange rate system which was determined by the Authorities. The second period 1966-1977 was characterized by a steady dismantling of the multitiered exchange rate system into a unified exchange rate in which devaluations occurred at short intervals. The third period 1978-1988 was identified by frequent devaluations separated by long periods of gradual exchange-rate movements.

2.1. The First Period 1960-1965

After Independence in 1945, Indonesia experienced accelerating inflation and intensifying balance of payments problems. The international exchange reserves were depleted, international credit standing was exhausted, and restrictions on international trade lowered the balance of payments transaction even further. During this period, Indonesia continually faced fiscal, trade and unemployment problems partly due to a high rate of population growth. President Sukarno implemented the philosophy of *Demokrasi Terpimpin* and *Ekonomi Terpimpin* to justify the direct state control of production and trade in the economy. Subsequently he was able to move the economy quickly into one of almost total state control. In the following years, however, corruption, black marketing and mismanagement were excessive. The economy was in a crisis; foreign exchange reserves were drained, price inflation exceeded 100 percent and terms of trade were deteriorating. At the beginning of 1960, the rupiah was devalued from 11.40 rupiah to 45.00 rupiah per US\$. At the same time the Ministry of Industry divided industrial enterprises into several groups for the purposes of allocating foreign exchange. On the import side, group I which consisted of commodities essential to the economy were imported at the official rate of 45.00 rupiah per US\$, while group II which comprised other commodities needed but not essential were considered to be free list commodities and could be imported without restriction with the exchange rate of 200 rupiah per US\$. On the export side, the Ministry of Trade set the prices for all export products. Exporters were required to surrender foreign exchange only up to the surrender price; export receipts in excess of the surrender price could be legally retained. Basically during this period Indonesia had a system of multiple official exchange rates for different types of international

transactions. This system proved to be ineffective ³. The results of multiple exchange rate were an upsurge in smuggling and successive deficits on the current account (Woo-Nasution 1989). In 1963 Indonesia entered into a military conflict with Malaysia. This in turn caused an increase in government expenditure. The Authorities financed the budget deficit by creating money and reimposing extensive price controls. Accordingly the supply of money and the inflation rate accelerated. The cost of living index doubled every year; in fact by 1965 the cost of living together with the inflation rate was doubling every month. The money supply increased by 156 percent in 1964, 283 percent in 1965, and 764 percent in 1966. Under such circumstances, the price controls were unable to curb the rate of inflation. The economic and political chaos ended with a military coup by the Communist Party on the night of 30 September 1965. General Suharto took over power from the Communist Party following the revolution. At that time, the country was in the midst of civil war, chaos and economic turmoil; there was a growing budget deficit, mounting external debt, acceleration inflation, an overvalued exchange rate and a huge deficit in the balance of payments. A change of government by General Suharto created a new commitment to a more liberal economy, placing liquidity and solvency as the goals of Indonesia's balance of payments, rescheduling the previous debts, and arranging for new capital inflows to support the balance of payments deficit.

³The reason for the multiple exchange rate is that the elasticity of primary exports and the elasticity of demand were low meant that devaluation may result in a loss of foreign exchange earnings (Glassburner 1971).

2.2. The Second Period 1966-1977

When General Suharto took power in 1966, Indonesia had a system of multiple exchange rates. The economy was in absolute chaos; inflation was running at over 1000 percent, and foreign exchange reserves were drained. The Bank of Indonesia was unable to pay even on cash letter credits (Panglaykim-Arndt 1966). The *Orde Baru* government under General Suharto undertook the liberalization of foreign exchange market. Before this period, the exchange rate structure had become substantially overvalued as a result of high domestic inflation in the economy. Suharto's new rehabilitation programme was the maintenance of a competitive and simplified exchange rate system. The rehabilitation part of the October 1966 programme was to allow market forces a greater role in resource allocation. The last four years (1966-1969) witnessed a struggle for the *Orde Baru* government to rehabilitate the economy. To improve the balance of payments, the government announced a dramatic change in monetary policy and devaluation of the Indonesian rupiah from 10 rupiah to 100 rupiah per US \$ (Arndt 1966, 1971). The significance of the changes in monetary policy was the dramatic slow down of money growth in the following years. In early 1967, the government decided that the emphasis of policy should shift from curbing inflation to encouraging domestic production by lowering interest rates, expanding domestic credit and devaluing the currency. A new exchange rate system was set up in 1970 to be equal to the free market exchange rate of 378 rupiah per US dollar. After this, the *Orde Baru* government was not reluctant to adopt a devaluation policy for correcting a deficit in the trade balance whenever necessary. In fact the devaluation policy was frequently undertaken with medium size exchange-rate change at short intervals. In this period, the new goal of balance of payments equilibrium in the short run was to maintain "strong" foreign exchange reserves in order to induce the confidence of domestic and foreign residents in the stability of the rupiah. Accordingly at that time Indonesia's

macropolicy was influenced mainly by what occurred in international exchange reserves. Poor performance of the balance of payments as shown by a decrease in the foreign exchange reserves caused an outward domestic capital flight, a decrease in the inflow of world capital, and a reluctance among Western nations to maintain investments with Indonesia. Another reason for focusing on the foreign exchange reserves was that they provided protection against short-term fluctuations in the balance payments (Rosendale 1981). After the revolution, in order to reform the economy the *Orde Baru* government applied for admission to the (IMF), the World Bank (WB) and the United Nations (UN). Representatives from the IMF visited Indonesia in 1966 to assist in formulating domestic economic policy, in discussing proposals for Indonesia's debt commitment. Trade liberalization was a prerequisite for the rescheduling of debts and obtaining new foreign credits. The liberalization followed as a result of the commitment of a single exchange rate. As a consequence of the liberalization, Indonesia started to gain credibility in the international community. The IMF has played an active role in helping to finance the structural and balance of payments adjustment needed in Indonesia after the 1965 revolution. In a nutshell the IMF imposed several conditions, among which were the commitment of a single exchange rate, trade liberalization and a tight monetary policy. The condition had an adverse effect since many of them were already part of the Development Plan (*Pembangunan Lima Tahun*). For example, in the beginning of *Repelita I* (1969-1973) foreign investments improved substantially. The growth of domestic credit helped the private sector, furthermore under the IMF stabilization programme, the government agreed to the commitment of the floating rupiah ⁴, and elimination of the multiple exchange rate system. During

⁴Although the government indicated that the economy were operating a "controlled float" using a weighted basket of currencies, however, the way the float appears to have been adjusted in a movable peg relationship to the US\$ only (International Currency 1983).

this period the *Orde Baru* government welcomed foreign investment by enacting a 1967 Foreign Investment Law and a 1968 Domestic Investment Law which offered attractive incentives to foreign investors. In the 12 years following the Foreign Investment Law, over US\$ 7.7 billion of foreign investment known as *Penanaman Modal Asing* had been approved, and private capital inflows were considerable. The economy began to grow while the receipts increased substantially due to an improved tax collection and an increase in world aid. The elimination of the budget deficit financed by money creation resulted in a decrease in the growth of money supply and consequently the rate of inflation lessened. With annual inflation being around 20 per cent in 1969, the government wished to minimize the cost-push inflationary effects of devaluation, and to stabilize the exchange rate changes. A steady trade deficit implied the accumulation of foreign debt on which service payments must be made if Indonesia wished to maintain its international solvency.

In early 1970 the domestic demand pressures caused a loss of the foreign exchange reserves. Then in April 1970 the Indonesian rupiah was devalued by 14 percent against the US\$. In the following years, however, cost pressures reemerged and caused a sharp drop in the foreign exchange reserves. The collapse of the Bretton Woods system and the floating of the US\$ produced the opportunity for a further devaluation in August 1971 by 9 percent to 415 rupiah per US\$. In that period, the export unit value index was low, while the volume of imports, particularly capital imports, for the economy development increased considerably. The 1971 devaluation was undertaken in response to the worsening of the current account deficit. This deficit to some extent was the result of the uncompetitiveness of exports, a slow down in world economic growth and high domestic inflation. In the period 1971-1977, the exchange rate remained constant at 415 rupiah per US\$. This stability was due to the fact that the balance of payments

was strong during the period; growing oil revenues led to a sizeable current account surplus. Besides that other macroeconomic indicators were stable with a fairly good economic performance. For the first time Indonesia began to accumulate international exchange reserves in 1972. This happened not because of an improvement on current account but as a result of a change in private capital inflows (Woo-Nasution 1989); a high domestic interest rate during the period attracted a large inflow of world funds to deposit in the Indonesian banks. Since the exchange rate was fixed, this capital inflow caused expansion of domestic money supply. At the same time, the economy benefited from the rise in oil prices. Accordingly the revenue export earnings doubled, and the imports also rose due to an expansion in domestic credit. At the end of 1973, a change in OPEC pricing policies caused the price of Indonesia's oil exports to quadruple. This further increased the foreign exchange reserves but exacerbated inflationary problems. This accumulation of international exchange reserves together with the rapid growth of domestic credit pushed money supply by 50 per cent in 1972-1973, accordingly the problem of inflation was further aggravated.

Most of the net foreign exchange earnings from oil exports were accumulated by the government in the form of taxes. While this had some advantage, it did create a problem; it allowed increased government expenditure. The government expenditure on imports was also increased with stockpiling of rice, fertilizer and with the purchasing of a huge amount of foreign capital and machinery for the development of the economy. By the end of 1975, the foreign exchange reserves were depleted. The build-up of the reserves restarted again in 1977 as a result of an increase in recovery in the volume of oil and timber exports, and large amounts of borrowing by the government which in turn caused an increase in domestic money supply.

2.3. The Third Period 1978-1988

This third period involved three large devaluations in 1978, 1983 and 1986 separated by long periods of gradual devaluation (graph 2.1). In 1978 the rupiah devalued by 50 per cent, marking the return to an active exchange rate management. This devaluation by 35% to 625 rupiah per US\$ on 15 November 1978 (referred to KENOP 15, a local abbreviation for *Keputusan Nopember 15* or "Decision November 15") was undertaken for reasons unrelated to balance of payments consideration ⁵. The devaluation was firstly seen as an anticipatory action to the drop in oil receipts. Accordingly it was appropriate to act before a crisis emerged to prevent financial chaos in the economy such as speculative capital outflows. Secondly, the devaluation was due to the economic difficulties and political tensions associated with the reallocation of resources. It has been anticipated to redistribute income sectorally by increasing the price of traded goods relative to those of non-traded ones and by increasing the relative income and factors employed in traded goods sector ⁶. However since the short run price elasticities of export supply and import demand were believed to be low, the devaluation would not bring an instant improvement in the trade balance, though exporters would gain substantially. Though the growth of the oil sector increased the GDP, it did not increase income equally in other sectors; it just raised the exchange rate and inflation due to the fact that the domestic monetary effects of the balance of payments surplus could not be sterilized because Indonesia's financial market was still

⁵At that time, the economic growth and the external balance were strong. International reserves were abundant however the real exchange rate had appreciated hurting the competitiveness of non-oil exports.

⁶Though the 1978 devaluation was proposed to offset the deterioration in the non oil industries, however there was a risk in assigning exchange rate policy primarily towards the goal of income distribution rather than to the goals of balance of payments because the policy may conflict with income distribution objective as well (Booth-McCawley 1981).

relatively underdeveloped. Consequently it worsened the welfare of factors of production employed in non oil industries. In this period, the chief influence on the growth of money supply was the expansion of domestic credit to the private sector. Accumulation of international reserves in conjunction with continued rapid growth of private sector credit pushed the money supply upward. At that time, the Indonesian government tried to make systematic efforts to rehabilitate the Indonesian Banking system in accordance with the more market orientated market approach.

Foreign investment improved the export sector considerably, however, traditional export crops such as rubber, coffee, tea, and pepper grew slowly because of the slow development in world demand, the spread of synthetic substitutes, and due to the low income elasticity of demand in industrial countries for basic foodstuffs such as coffee, tea, and spices. However foreign investment stimulated the development of mineral and timber exports. Net factor payments and other imports of goods and services increased as well. Foreign exchange reserves rose from the oil sector. Throughout the 1970s and 1980s Indonesia was unusual among developing countries in that it had minimal foreign exchange controls (Lane-Cole-Slade 1991). After the rise in the oil price, the Authorities initiated renegotiation of both contract of work and production sharing agreements; it greatly increased its own share of profits. Development of non oil minerals and timber for export has been left to the private sector where foreign investors are required to operate under the Foreign Investment Law. The main benefit of foreign investment was reflected in the increased government taxes and royalties. In 1983 and 1986, devaluations were undertaken to boost the competitiveness of non-oil exports in the face of a decline in oil export earnings. The rupiah was devalued by 40 percent in 1983 and by 45 percent in 1986.

2.4. Main Features of the Economy

Indonesia is the fifth most populous country in the world. It is the world's largest archipelago consisting of around 13 thousands islands. Economic Planning in Indonesia is based on a series of five-year plans (*Repelita*). *Repelita* or *Rencana Pembangunan Lima Tahun* means Five Year Development Plan. *Repelita I* stands for the First Five Year Development Plan 1969-1973, *Repelita II* for the Second Five Year Development Plan 1974-1978, *Repelita III* for the Third Five Year Development Plan 1979-1983, *Repelita IV* for the Fourth Five Year Development Plan 1984-1988.

Table 2.4.1 ⁷
Main Features of Indonesia's Economy 1988

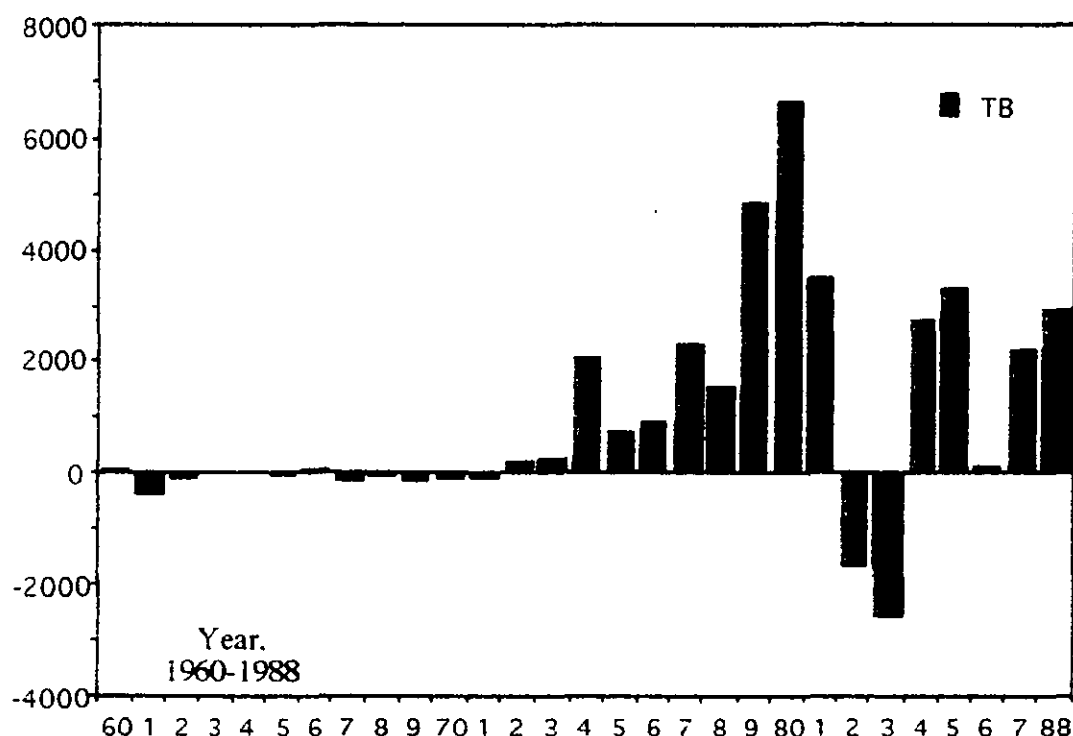
Features	Figures
Population	176 million
Population Growth	2 per cent
Life Expectancy	63 years
GDP	83 US\$ Billion
GDP Per Capita	470 US\$
Share in GDP	
Agriculture	24 per cent
Industry	36 per cent
Manufacturing	18 per cent
Services	40 per cent
Share in Employment	
Agriculture	54 per cent
Industry	16 per cent
Services	30 per cent
Imports	
Merchandise Imports cif	17 US\$ Billion
Merchandise Imports cif to GDP ratio	19 per cent
Exports	
Merchandise Exports cif	21 US\$ Billion
Merchandise Exports cif to GDP ratio	24 per cent

With merchandise exports of 24 US\$ billion and imports of 17 US\$ billion, Indonesia was the world's 31st largest exporter and the 35th largest importer of merchandise for its economic

⁷The figure is obtained from IFS.

development. In fact the ratio average of exports plus imports to GDP is relatively high, 21.5 per cent, compared to most developed countries (GATT 1991). Hence international trade and investment have played a significant role in promoting economic growth and balance of payments development. Dominant sources of balance of payments earnings come primarily from exports of primary commodities and minerals. Accordingly falling primary commodity prices particularly for petroleum depressed and fluctuated Indonesia's trade performance as shown in graph 2.4.1.

Graph 2.4.1
Merchandise Trade Balance in Million of US\$



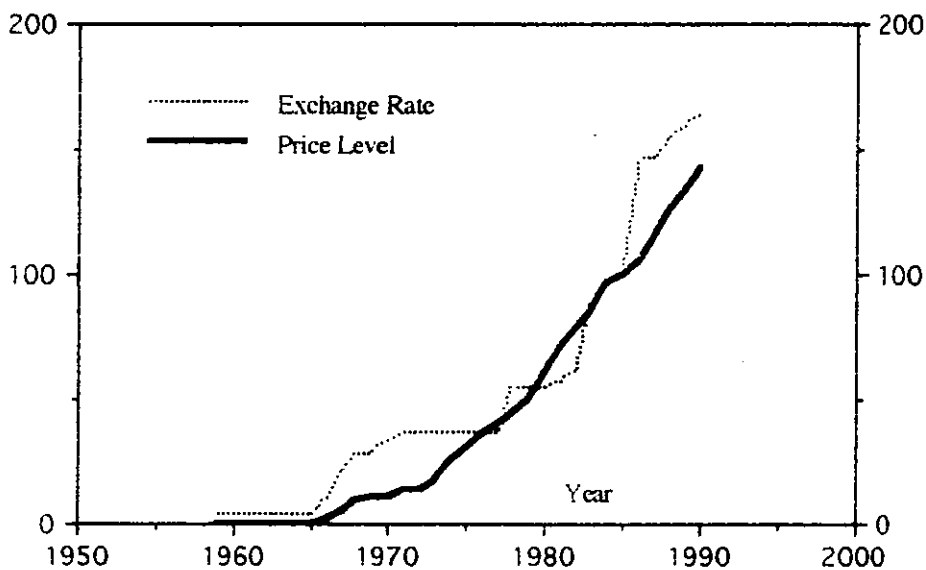
Most of the export earnings from petroleum and other primary commodities accumulated by the government in the form of revenue. This phenomena in the second round would increase government spending thereby leading to an increase in the absorption ($A+C+I+GE$). Consequently it also raised the money supply. Furthermore due to the nature of primary commodity,

Indonesia's terms of trade have fluctuated considerably during the past 20 years (see table 2.4.2) depending on the world market. Imports can be disaggregated into four categories to indicate the four different roles played by imports in the economy. First the importation of rice and cereals to supplement domestic economy. Second the importation of processed foodstuff, textiles, and consumer durables. Third the importation of raw materials such as raw cotton, yarn, cement, steel products, fertilizer, and insecticides. Fourth is the capital investments or machines for agriculture, manufacturing, mining and public utilities which consists, the largest amount of imports. Around 60 to 70 per cent of imports constituted machinery and the like for economy development.

Indonesia has been hampered with balance of payments problems and has undergone successive devaluations. The performance of the economy improved in the years succeeding 1965. Indonesia's first development plan, fiscal year 1969-1973, was preceded by a successful economic stabilization programme in 1966-1968 which reversed negative growth, eradicated hyperinflation, liberalised foreign exchange controls on capital movements and created a partially convertible rupiah currency. The subsequent economic recovery of Indonesia during this period was cited by economists as an example of successful financial liberalisation. The Indonesian balance of payments has changed considerably since 1966 due to the new stabilization policies established by Suharto's government and the oil boom. The economy experienced an oil boom which increased receipts and inflation via expansion of the domestic money supply. The economy grew considerably more open after 1966. Imports have grown rapidly, financed by capital inflows and domestic credit expansion. One of the purposes of Indonesia's devaluations is to improve the incomes of the non oil traded goods sectors (cheapening their export prices), the goal of longer-run growth and employment strategy. Since the several devaluations took places, the Indonesian Rupiah has

persistently lost its value as the graph 2.4.1 below indicated by the upward movement of the effective exchange rate (domestic price of foreign currency).

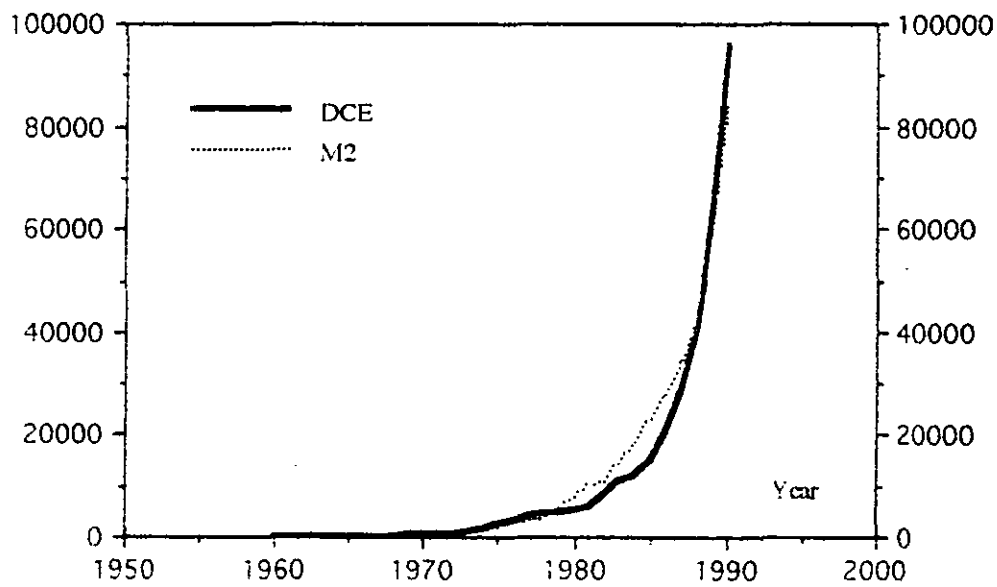
Graph 2.4.1
Nominal Effective Exchange Rate and Price Level (1985=100)



The above graph shows that domestic price levels follow closely the movement of exchange rate in the economy. The basic reasons were that the publicity of devaluations might cause a greater price responsiveness, following devaluations producers may take the opportunity of raising prices of all goods not just those that are affected, and incorrect macro policy by the Authorities such as public-wage adjustment (*Naik Gaji*) might lead to high wages; a cost-push spiral. This could sharply diminish the "real" exchange rate changes that results from "nominal" exchange rate changes thereby simply reducing the power of a devaluation policy. Domestic price effect of devaluations was significant due to the substitutability between imported and domestic goods in consumption, and the big share of imports in total output.

For the first time Indonesia began to accumulate international exchange reserves in 1972 because the economy benefited from the rise in oil prices. Accordingly the revenue of export earnings doubled, and the imports also rose due to an expansion in domestic credit. This accumulation of international exchange reserves together with the rapid growth of domestic credit pushed money supply by 50 per cent in 1972-1973. Accordingly the problem of inflation was further aggravated as indicated by graph 2.4.2 below that domestic credit expansions have been increasing dramatically during the period of development, particularly in the years 1974 to 1988. In that time frame, the Authorities also tried to make a strong effort to rehabilitate Indonesia's Banking system to be more market oriented. One of the government objectives is to create a banking system which could play an active role in the task of economic development.

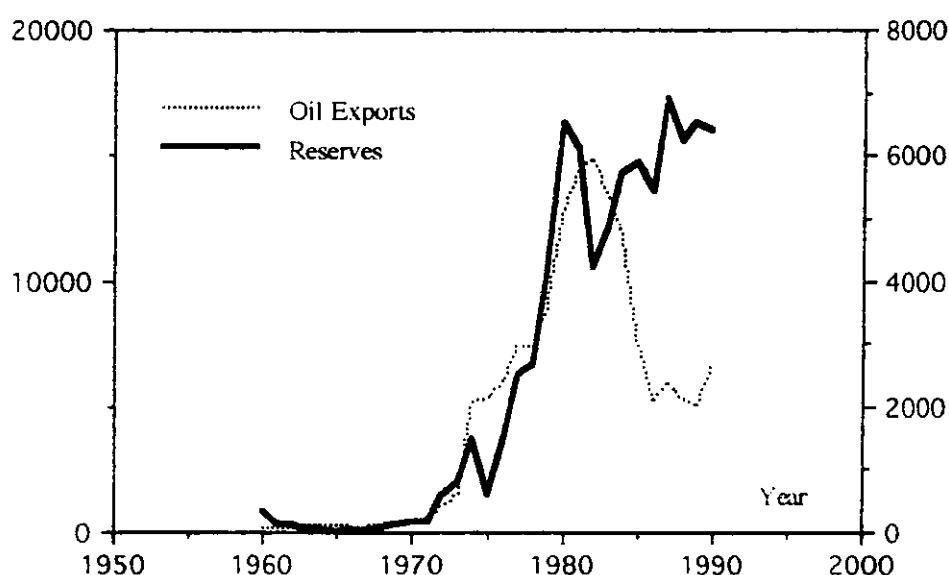
Graph 2.4.2
Domestic Credit Expansion and Money Supply (M2)



The upward movement of the reserves comes primarily from an expansion in crude oil exports, oil price rise (graph 2.4.3) and to a change in the nature of private capital inflow and foreign

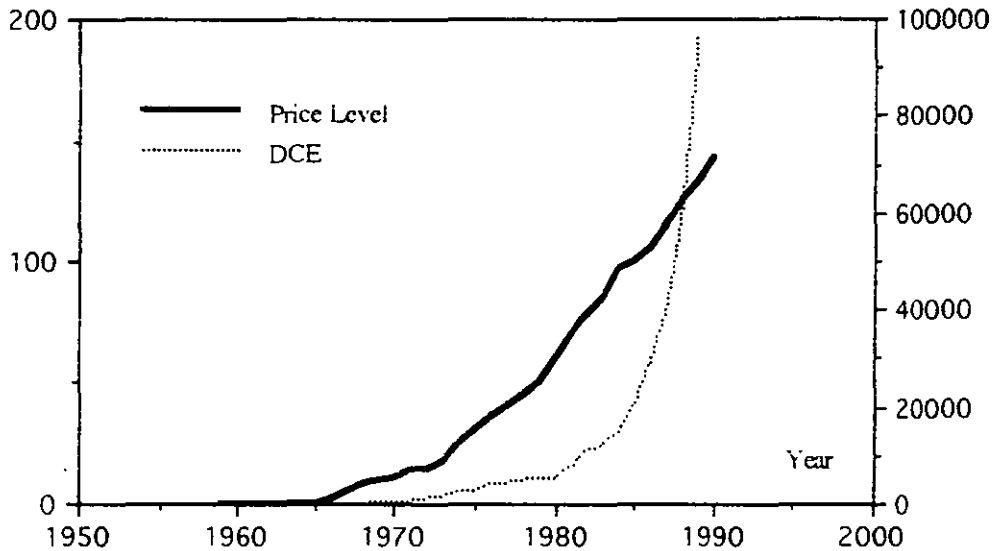
direct investment, whereas the downward trend is caused by a massive expansion of credit creation (see table 2.4.2) which is used to finance economy development. The effect of rising international reserves from the rise of oil revenue has been providing the reserve money base for very rapid expansion of bank credit, both domestic assets and credit, partly in accomodating cost-price inflation, and partly in response to a domestic investment boom.

Graph 2.4.3
International Reserves and Oil Exports



The Indonesian economy has been characterized by periods of increasing real income particularly after the year of 1977. Suharto's economic policies combined with the effect of oil price increase has led to a marked change in the structure of the economy to achieve a higher standard of living as indicated by graph 2.4.5. The economy has become more liberated; the private and the public sectors have been linked with international capital markets. The advent of the *Orde Baru* in establishing the *Stabilisasi Ekonomi* has been succesful in generating flow of foreign investments and in raising output.

Graph 2.4.4
DCE and Domestic Price Level

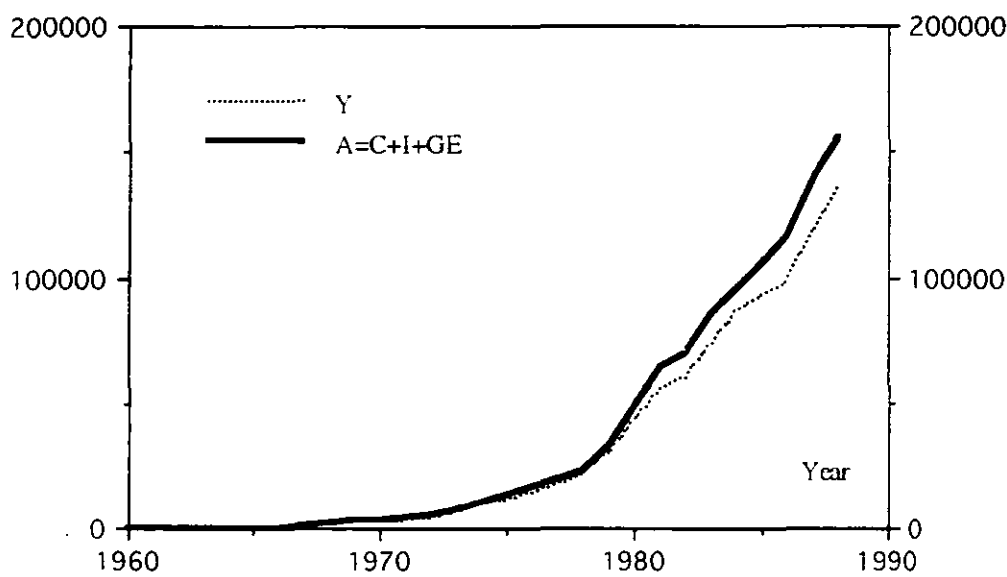


The Authorities have been undertaking successive devaluations to counteract the loss in the foreign exchange reserves throughout the years 1968, 1973, 1978, 1983, 1985 and 1987 due to the weak performance of the domestic production. The gradual emphasis on balance of payments policy to the liquidity and solvency considerations has been significant in the New Order (*Orde Baru*) period. The advent of the *Orde Baru* in establishing the *Stabilisasi Ekonomi* has been successful in generating flow of foreign investments. The objective of the monetary policy has been broadly to moderate the rate of inflation, to run a sustainable balance of payments, and to provide for adequate foreign exchange reserves.

An increase in the total absorption ($A=C+I+G$) materialized especially after the year of 1977 (graph 2.4.5) when the Indonesian government established the Investment Plan (by importing a huge amount of capital to achieve growth target) during *Repelita II & III*. The average propensity to import (API)

also rose due to the rise in the share of capital investment and the degree of openness in the economy.

Graph 2.4.5
Total Absorption



During the *Repelita I to IV*, devaluations have been a common phenomenon in the economy. One of the purposes of devaluation policy in Indonesia is to give price incentives in domestic currency to factors of production in the traded sector. The price incentive is expected to encourage the movement of factors from the non-traded to the traded sector thereby making the structure of the economy more efficient. Devaluations were also meant to boost the competitiveness of non-oil exports in the face of a decline in oil export earnings as evident from declining terms of trade (see table 2.4.2).

Table 2.4.1

Year	£	DCE	R	P	A
1960	45.28	0.051	352	0.004	0.221
1961	45.28	0.083	133	0.006	1.325
1962	45.28	0.152	108	0.015	22.084
1963	45.28	0.314	58	0.034	66.254
1964	45.28	0.818	25	0.073	154.59
1965	36.00	17	21	0.318	638.88
1966	122.00	38	23	2.347	2598.36
1967	235.00	70	6	4.995	3634.04
1968	326.00	133	87	9.231	6254.60
1969	326.00	281	122	10.149	9276.99
1970	378.00	295	160	11.050	9547.08
1971	450.57	373	187	14.124	9510.12
1972	450.57	388	577	14.243	12026.98
1973	500.64	479	807	17.202	17178.31
1974	508.11	646	1492	25.344	26379.03
1975	485.82	1854	586	30.442	33718.07
1976	482.16	2136	1499	36.461	40616.38
1977	504.10	2328	2516	40.877	47536.38
1978	814.24	3512	2663	45.000	36773.28
1979	825.97	4049	4167	50.304	53258.85
1980	799.36	4921	6500	60.784	77370.72
1981	749.59	6164	6076	71.112	100277.1
1982	763.90	9281	4196	78.337	100692.2
1983	1040.70	10061	4814	85.095	86496.17
1984	1052.70	12564	5720	96.427	88845.53
1985	1235.70	12862	5880	100.000	93762.57
1986	2007.30	17692	5411	105.783	70918.64
1987	2340.80	20770	6911	115.458	84445.15
1988	2329.40	27534	6206	125.385	90162.10

* All figures are stated in millions US\$ except A and DCE in billions of Rupiah (see chapter 5 about Data)

Table 2.4.2

Year	GNP	M	X	CB	TOT
1960	8.5468	574	881	-58	23.33
1961	10.2694	794	766	-461	20.06
1962	29.2844	647	711	-212	19.77
1963	69.9646	521	656	-201	20.54
1964	154.880	680	631	-205	19.29
1965	625.833	695	633	-222	18.80
1966	2549.180	527	714	-108	17.55
1967	3565.957	649	771	-254	16.78
1968	6343.558	716	872	-225	16.87
1969	8230.061	781	995	-336	18.99
1970	8703.703	1002	1173	-310	30.18
1971	8686.746	1103	1311	-372	28.93
1972	10614.45	1562	1793	-334	32.21
1973	15681.92	2729	3215	-476	37.90
1974	24580.72	3842	7265	598	65.38
1975	29125.30	4770	6888	-1109	63.74
1976	36228.91	5673	8613	-907	66.06
1977	44173.49	6230	10763	-51	68.56
1978	34966.40	6690	11035	-1413	62.68
1979	48709.72	7202	15154	980	76.28
1980	69301.95	10834	21795	2864	96.43
1981	87262.42	13272	23348	-566	101.00
1982	87358.84	16859	19747	-5324	101.54
1983	74788.73	16352	18689	-6388	94.12
1984	79797.02	13882	20754	-1856	93.54
1985	82716.44	10262	18527	-1923	100.00
1986	60018.28	10718	14396	-3911	76.18
1987	71996.96	12891	17206	-2098	79.36
1988	78095.32	13249	19382	-1189	66.44

* All figures are stated in millions US\$ except A and DCE in billions of Rupiah (see chapter 5 about Data)

CHAPTER 3

REVIEW OF THEORETICAL LITERATURE

The focus of this literature survey will be on the theoretical analyses of the balance-of-payments, namely with the economic determinants of the balance of payments, and with the analysis of government policies for maintaining balance of payments equilibrium. There are five main theoretical approaches which can be applied to the balance of payments, the Elasticities Approach to the Balance of Payments (EABP), the Absorption Approach to the Balance of Payments (AABP), the Monetary Approach to the Balance of Payments (MABP), the Capital Market Approach to the Balance of Payments (CMABP) and the Structural Approach to the Balance of Payments (SABP). All the theories aim to explain contrasting aspects of the balance of payments, so they may be viewed as complementary rather than competitive. The traditional Elasticities and Absorption approaches explain the balance of trade ¹, the Monetary approach discusses the overall balance (the capital and current account), the Capital Market approach extends the Monetary approach by focusing on the spectrum of assets which comprise wealth portfolios, and the Structural approach looks at the balance of payments deficits as structural problems. These theories also have distinctive aspects. The traditional Elasticities theory employs a microeconomic approach to the adjustment in the goods market, the Absorption theory employs a macroeconomic approach also in the goods markets. The Monetary model utilises a theory of equilibrium only in the market for money while the Capital Market approach employs a

¹In the recent development of balance of payments accounting, economists use CB (Current Account Balance) instead of TB (Trade Balance) (Miles 1978).

theory of equilibrium in the markets for money and other assets. The Structural approach views balance of payments deficits as a structural problem and enveloping extensive discussions of non-price factors such as the structure of production and trade as determinants of balance-of-payments performance.

3.1. The Elasticities Approach to the Balance of Payments (EABP)

The traditional view of the balance of payments adjustment is embodied in the Elasticities approach. This approach promoted initially by Robinson (1947) concentrates on the price elasticities of demand and supply for exports and imports; the elasticities condition necessary for a devaluation to improve the trade balance components of the balance of payments. It models the trade balance (exports and imports) by a microeconomic approach by focussing on the choice between domestic and international goods based on the movement along given supply and demand curves in the particular markets. It is a partial-static-equilibrium analysis in the sense that it considers only the effect of exchange-rate variations in the specific market for a nation's exports and imports *ceteris paribus* the position of the demand curves for the exports and imports themselves being held constant. The approach assumes that (1) traded goods are in perfectly elastic supply, (2) the prices are fixed in domestic currency, and (3) the economy can facilely employ more resources into production for exports and imports substitution without any barrier.

1st scenario of the Marshall-Lerner condition, for $d\xi > 0$ in order $dTB > 0$ is as follows (for a complete mathematical treatment, see appendix 3A) is

$$\{ \varphi_X(\eta_X-1) (\varphi_X+\eta_X)^{-1} \} + \{ \eta_m(1+\varphi_m) (\varphi_m+\eta_m)^{-1} \} > 0 \quad 3.1.1$$

where dTB stands for the change in the nation's trade balance measured in domestic currency, $d\xi$ for the change in the exchange rate, X for exports, M for imports, φ_X for the elasticity of export supply, η_X for the elasticity of export demand, η_m for the elasticity of import demand and φ_m for the elasticity of import supply.

2nd scenario of the ML condition or the necessary condition for devaluation to improve the trade balance is if the total of the price elasticities of demand for exports and imports exceeds one ($\varphi_X=\varphi_m=\infty$, a nation whose supply of exports and the supply of imports are infinitely inelastic. This condition is relevant for an industrialized country whose export consists of manufacturers in which most of the manufacturers are also sold in the domestic market). By finding the limit of equation 3.1.1, it yields

$$\text{Limit}_{\varphi_X, \varphi_m \rightarrow \infty} [\{ \varphi_X(\eta_X-1) (\varphi_X+\eta_X)^{-1} \} + \{ \eta_m(1+\varphi_m) (\varphi_m+\eta_m)^{-1} \}] \quad 3.1.2$$

$$\frac{dTB}{d\xi} > 0 \quad \text{if} \quad \eta_X + \eta_m > 1 \quad 3.1.3$$

3.1.3 is the general case of the well-known Marshall-Lerner criterion which is applied mostly to industrialized countries. The above equation states that a devaluation would ameliorate the balance of payments on the trade balance if the total of the price elasticities of demand for exports and imports exceeds one

3rd scenario of the ML condition or the sufficient condition for devaluation to improve the trade balance is if the sum of the price elasticities of demand for imports and of supply of exports is greater than zero ($\eta_X=\varphi_m=\infty$, a nation with infinitely

elastic world demand for exports as well as supply of imports. This condition is relevant for a small-developing country), then by taking the limit of 3.1.1, it yields

$$\lim_{\eta_m, \varphi_m \rightarrow \infty} [\{ \varphi_x(\eta_x - 1) (\varphi_x + \eta_x)^{-1} \} + \{ \eta_m(1 + \varphi_m) (\varphi_m + \eta_m)^{-1} \}] \quad 3.1.4$$

$$\frac{dTB}{d\xi} > 0 \quad \text{if} \quad \varphi_x + \eta_m > 0 \quad 3.1.5$$

The EABP views devaluation as the potent mechanism of adjustment; it suggests the computation of the above price elasticities as the analytical tools by which macroeconomic policies (such as exchange rate policy, monetary and fiscal policies and commercial policy ²) can be adopted to achieve the balance of payments target.

If the above long-run elasticities exceed unity, the devaluation will be successful. However, according to theoretical and empirical literature on the international trade, the short-run effect of devaluation may be to worsen the current balance, before improving it after a lag of some 3 months to 3 years (Artus 1973, Junz-Rhomberg 1973, Cairncross-Eichengreen 1983); the well-known "J-curve effect" hypothesis.

In estimating the above price elasticities of imports and exports, it is assumed that domestic price level were constant (no "pass-through" effect). To examine this assumption (the robustness of the price elasticities of exports and imports), pass-through function will be estimated. This study will also examine the transmission of the nominal exchange-rate onto

² Since devaluation affects the nation's terms of trade, the terms of trade may rise or fall depending on whether the exports price rises or falls relative to the imports price following the devaluation. Commercial policies such as tariffs, quota and export subsidies are designed to encourage import substitution and export oriented productions hence improving a nation's terms of trade.

domestic prices (the so-called "pass-through" coefficient), the stability of the pass-through coefficient, as well as the transmission of import prices onto domestic prices (the so-called "imported inflation" hypothesis). The transmission of exchange rate and import price variables onto domestic price is important in analyzing the final effect of devaluation. If the transmission coefficients are significant, devaluation will induce higher domestic price thereby accelerating inflation. Accordingly the benefit of the price effects on the imports and exports induced by the devaluation would be negated by inflationary effects of the devaluation; if "pass-through" effect was significant, if a country devalued its currency by 10 percent for example, it would raise the domestic price level by the same amount ! Therefore the effective net increase of the price of foreign exchange is much less than nominal devaluation (since devaluations are followed by inflation).

Different kinds of analysis can be made in which changes in exchange rates are transmitted to domestic prices. On the one side, firstly, domestic producers and wage earners may react less to a small devaluation due to transaction costs in imperfect markets, secondly, the publicity of a large devaluation may cause a greater price responsiveness, thirdly, following a large devaluation, producers may take the opportunity of raising prices of all goods not just those that are affected, and fourthly, incorrect macro policy by the Authorities such as public-wage adjustment and excessive domestic credit following devaluation may lead to high wages; a cost-push spiral. On the other side, if expectations are regressive, exchange rate changes in one direction may lead to expectations of sustained movements in the same direction which could affect the inflation rate ³. A "ratchet effect", in which prices are revised upwards following devaluation but not

³For example, a study by Fenberg-Kaplan (1992) reveals that domestic prices may respond not to actual exchange-rate alone but to anticipated effects as well.

adjusted downwards following revaluation, is also possible. Thus the response of domestic prices to exchange-rate changes depends upon the assumptions about the preferences of economic agents and the way expectations are formed. Therefore the model becomes an empirical one, although this results in *ad hoc* modelling leading to provisional findings that await better "pass-through" theory (Dixit 1989). The analytical framework for analysis of pass-through can be derived by estimating a price equation as follows

$$P_t = \phi (M_t, P^m_t, \xi_t) \quad 3.1.6$$

where $\partial P_t / \partial M_t > 0$, $\partial P_t / \partial P^m_t > 0$, and $\partial P_t / \partial \xi_t > 0$

The pass-through of a given exchange rate may well change over time. Previous studies suggest that there were significant lags in the response of domestic prices to changes in the exchange-rate (Harberger 1963, Lowinger 1978, Rana-Dowling 1985). Formulating the above equation in terms of Stock Adjustment (SA) lags, it yields

$$P_t = \pi_{10} + \pi_{11} M_t + \pi_{12} P^m_t + \pi_{13} \xi_t + \pi_{14} P_{t-1} + u_{30t} \quad 3.1.7$$

where $\pi_{11} > 0$, $\pi_{12} > 0$, $\pi_{13} > 0$ ⁴, P is domestic prices, M is money supply, P^m is import price index, ξ is exchange rate, and t is time. Domestic prices adjust only $(1-\pi_{14})$ to the long run level whereby $0 < (1-\pi_{14}) < 1$. $(1-\pi_{14})$ is the coefficient of adjustment falling between zero and one.

Besides the Marshall-Lerner methodology, other methodologies to test the efficacy of exchange rate adjustments are, firstly, to directly examine the impact of exchange-rate changes on

⁴It is expected that money supply will exert a positive effect on domestic prices ($\pi_{11} > 0$). If imported inflation is to contribute to domestic inflation, it is expected that $\pi_{12} > 0$. Devaluation in domestic currency which is reflected in an increase in the nominal exchange-rate is expected to exert a positive effect on inflation ($\pi_{13} > 0$).

various macroeconomic variables; regressing exchange-rate changes on macroeconomic indicators (Miles 1979, and Edwards 1985), or secondly, to examine key indicators of economic performances moved (such as trade balance, imports, exports, net capital flows, international reserves, inflation, exchange rate, gross domestic product) before, during and after devaluations (for example see Cooper 1971, Bhagwat-Onitsuka 1974, Kamin 1988). The movement of economic indicators following devaluation can be caused by devaluation itself, monetary or fiscal policy, changes in the world factors, and changes in the domestic factors. The methodology is based on a before-and-after analysis and employs statistical tests (the Wilcoxon rank-sum and t tests) in comparing the behaviour of devaluing countries to that of a control group of countries (comparing statistically macroeconomic indicators for several years preceeding and following devaluations, for example see hypothetical table 3.1.1). The t test can be used for examining the mean of differences in all macroeconomic indicators whereas the Wilcoxon rank-sum test for blocked data is used for examining the changes in macroeconomic indicators between the devaluing countries and the group of countries (see for example Kamin 1988).

Table 3.1.1
Statistics of Imports, Exports, Trade Balance,
Price Level, and Reserves following Devaluations

	T-3	T-2	T-1	T	T+1	T+2	T+3
Statistics							
Mean							
Median							
Changes from previous period							
Number Increasing							
Number Decreasing							
Probability if Ho true							
t-statistics							
Median							

Criticism

First, Alexander (1952) argues that the Elasticities approach only focuses on the specific markets for exports and imports, i.e, a microeconomic treatment; it is essential to look at the production and spending of the economy which shift these markets as a whole, i.e, a macroeconomic approach. It is an unrealistic approach since it requires restrictive assumptions to employ the Elasticities model in the economy (Dornbusch 1975). Second, the aggregate elasticities are virtually impossible to measure; it is uncertain which elasticity is relevant to the Marshall-Lerner formula if a nation exports and imports several different goods, and there is also an aggregation problem. Moreover the problem in measuring the elasticities are severe. For example Orcutt (1950) argues that there are several factors biasing downwardly the estimated elasticities of demand for internationally traded goods and services. Third, it is implicitly assumed that all supply elasticities equal infinity; it is doubtful that domestic producers could increase their production continuously in response to a sudden increase in the world demand following devaluation. Fourth, the major factor missing in the Elasticities approach is income effects; the approach assumes that the income elasticity of demand for all goods and services is zero. It is implausible in reality. Fifth, since it deals only with the goods market (exports and imports), the approach totally neglects the assets and monies market (including the monetary effects of the exchange rate alteration). Sixth, Regarding the "pass-through" function, The model however has several limitations. It is a partial equilibrium model since pass-through is defined as a partial derivative (direct effect only). A general equilibrium model might take into account indirect effects of exchange rates on the prices through their effects on the other determinants of prices. The full-effects (direct and indirect) would depend on the extent of the decline in the Indonesian rupiah affecting the other determinants of domestic prices. In terms of equation 1.28 & 1.29, the full

effects depend on how the exchange-rate variable affected the other explanatory variables in the model which in the second instance would affect the domestic prices. This concept is known as "channel-map" in the literature.

3.2. The Absorption Approach to the Balance of Payments (AABP)

To answer the criticism of the partial equilibrium nature of the Elasticities approach, the Absorption approach was introduced by Alexander (1952). The approach shows that a nation's trade balance will ameliorate if its output (Y) increases by more than its absorption (A) ⁵ following exchange-rate adjustment. It concludes that unless a nation's macroeconomic variables are affected, no balance-of-payments strategy will be effective.

Letting the signs of TB, Y, C, I, G, X, M, and A stand for trade balance, output, consumption, investment, government expenditure, export, import, and absorption, the Keynesian income-expenditure identity may be written algebraically as follows

$$Y = C + I + G + (X-M) \quad 3.2.1$$

since $TB = X-M$, and $A = C+I+G$, 3.2.1 reduces to

$$TB = Y - A \quad 3.2.2$$

Equation 3.2.2 states that the trade balance is merely the difference between total output and total absorption in terms of *ex post* and *ex ante* ⁶. Thus, if a nation wants to rectify its trade balance, the government actions (both expenditure reducing and switching policies) must influence either income or expenditure. In fact Johnson (1961) argues that according to the Absorption approach the removal of a balance of payments deficit would need the simultaneous adoption of expenditure switching and reducing policies.

⁵In Alexander's terminology, the locution "absorption" connotes expenditure on both goods and services.

⁶*Ex ante* means if domestic residents plan to spend more than they earn, they must be prepared to run deficit, while *ex post* conveys that it is accounting identity.

To see the effect of devaluation policy on its trade balance, equation 3.2.2 is differentiated in terms of change into

$$dTb = dY - dA \quad 3.2.3$$

since the absorption change consists of both a direct element (dA^d) and an indirect element ($dA^i = \alpha dY$), where α is the total of the marginal propensity to consume MPC (χ), the marginal propensity to invest MPI (δ) and the marginal propensity to undertake government expenditure MPG (ψ), or $\alpha = \chi + \delta + \psi$, then by substitution the equation 3.2.3 alters to

$$dTb = dY - dA^i - dA^d \quad 3.2.4$$

$$dTb = (1 - \alpha) dY - dA^d \quad 3.2.5$$

equation 3.2.5 merely affirms that the devaluation may correct balance-of-payments, if the Alexander condition below is satisfied

$$(1 - \alpha) dY > dA^d \quad 3.2.6$$

in line with equation 3.2.6, ergo the consequences of devaluation policy is contingent on how the devaluation affects real income (dY), on the Marginal Propensity to Absorb ($MPA = \alpha$), and on the direct absorption effects (dA^d). Those main effects ⁷ may be illustrated as follows

Table 3.2.1
The Main Effects of Devaluation

$(1 - \alpha) dY$	dA^d
Idle-resource effect	Cash-balance effect
Terms-of-trade effect	Income-redistribution effect
Money-illusion effect	

⁷Synthesized from Alexander (1952) and Machlup (1955).

Because of unemployed resources in the economy, the rise in exports following the devaluation provokes an enlargement in domestic real income via the foreign-trade multiplier process (idle-resources effect). Paradoxically devaluation may also engender a deterioration in a country's term-of trade, consequently a reduction in the real income (terms-of-trade effect). Due to those contradictory effects (an enlargement and a reduction in income), the sign of dY is ambiguous depending on the magnitude of α . If α is larger than unity, the devaluation is going to bring about a negative impact because the induced effects on absorption would be greater than the original effect on production.

In terms of direct effects, the devaluation will increase the domestic price of imports, and the general price level. This will be lowering the people's real value of wealth. The domestic residents may build up their cash balance by decreasing the absorption (cash-balance-effect). Assuming that prices and income rise in the same proportion, real income does not change. However if domestic residents do not realize this phenomenon, they may change the absorption (money-illusion effect), the direction of change is contingent upon the type of money illusion in the economy. Finally, the rise in prices owing to devaluation will bring a redistribution of income (income-redistribution effect). This, in turn, affects absorption because the diverse groups of income recipients have different Marginal Propensities to Absorb or to spend. In the case of developing countries, devaluation will allocate income toward the primary sector since developing countries export mostly primary goods (Kindleberger 1982)

The approach further argues that the devaluation shall only be successful if it causes the gap between output and absorption to widen, emphasizing that changes in the exchange rate will not lead to a permanent correction in the trade balance unless the government establishes sufficiently contractive monetary

and fiscal policies. Stating it differently, unless consumption declines relative to production as domestic currency is devalued, the current account deficit shall persist. In this fashion, devaluation may be necessary to reduce the trade deficit, however, if excess demand remains after the devaluation, then domestic price level would rise, and the competitive improvement caused by the devaluation would be negated by the subsequent increase in consumption and imports without any reduction of the previous deficit. Macropolicy implication of the AABP is to put much emphasis on the aggregate demand management as a determinant of the balance of payments rather than on the relative price level as theorized by the EABP. However Machlup (1955, 1956) argues that it was totally incorrect to ignore the relative price of imports and exports, and to center just on the absorption and income because relative prices play an important role in determining the terms-of-trade effect and the marginal propensity to spend (MPA). Finally Alexander (1959) responded to the argument by amalgamating the Elasticities and the Absorption theories so that

$$\begin{array}{llll} \text{Devaluation} & = & \text{initial effect} & + & \text{multiplier effect} & & 3.2.7 \\ \text{effect} & & \text{(Elasticities approach)} & & \text{(Absorption approach)} & & \end{array}$$

Letting Ω stands for the initial change in the balance of payments calculated by the previous equation 3.2.11, μ for the marginal propensity import, β for the marginal propensity to hoard; where $\beta = 1 - \alpha$, and i denotes country ($i=1,2$ where 1 is home country, and 2 is the country of the peg). Thus, the simple two-country model suggested by Alexander (1959) for the final change in the balance of payments (dTB) may be deduced formally

$$dTB = \{ \Omega (\tau_1 \tau_2) \} \{ (1 - (\gamma_1 \gamma_2)) \}^{-1} \quad 3.2.8$$

where τ_i is the ratio of marginal propensity to hoard to the sum of of this propensity and the marginal propensity to import in nation i , formally as

$$\tau_i = (1 - \chi_i - \delta_i) \{ (1 - \chi_i - \delta_i + \mu_i) \}^{-1} \quad 3.2.9$$

and γ_i is the ratio of marginal propensity to import to the sum of this propensity and the marginal propensity to hoard in nation i , or

$$\gamma_i = \mu_i \{ (1 - \chi_i - \delta_i + \mu_i) \}^{-1} \quad 3.2.10$$

Substituting the equation 3.2.9 and 3.2.10 into 3.2.8, and multiplying with $(1 - \chi_1 - \delta_1 + \mu_1)(1 - \chi_2 - \delta_2 + \mu_2)$, equation 3.2.8 is modified to

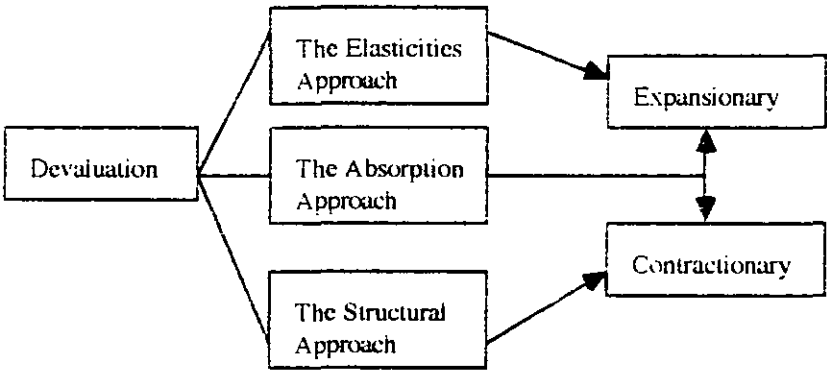
$$dTB = (\Omega)(1 - \chi_1 - \delta_1)(1 - \chi_2 - \delta_2) \{ (1 - \chi_1 - \delta_1 + \mu_1)(1 - \chi_2 - \delta_2 + \mu_2) \}^{-1} \quad 3.2.11$$

In connection with the above synthesis, Tsiang (1961) argued that the "marriage" between the Elasticities and the Absorption theories was not accurate since the multiplier effect of the initial departure in the trade balance would bring additional deviation in relative prices and further substitution between domestic and international goods. Notwithstanding Johnson (1958) remarks that the unending dispute was helpful in stressing the significance of monetary aspects in the theoretical analysis of the balance of payments. The thorough treatment of the balance-of-payments analysis must, however, be anatomized in the context of the dynamics of the whole economic system, not partial or sectoral management such as the Elasticities and the Absorption approaches.

The more recent or modified theoretical analysis of exchange-rate changes in relation to the Absorption Approach (AABP) in developing economies has been developed by Cooper (1971), Krugman-Taylor (1978), Lizondo-Montiel (1989) and Diaz-

Alejandro (1965). They basically argue that the "traditional" Absorption view to exchange-rate changes is not valid since it employs the partial equilibrium model like the Elasticities Approach to the Balance of Payments. They argue that exchange-rate changes in developing countries like Indonesia can be contractionary, not expansionary (see figure 3.2.1). Moreover when the exchange-rate changes followed by "common" contractionary policies such as tight monetary and fiscal policies in developing countries, the outcome would be a deep recession in the economy.

Figure 3.2.1
Expansionary and Contractionary Effects of a Devaluation



There are several factors in which devaluation leads to a contraction. The traditional views of exchange-rate changes argue that devaluation will stimulate export industries and import competing industries by improving the relative prices of traded *vis a vis* nontraded goods, therefore allocating domestic resources toward exports and import substituting industries and corrects the balance of payments disequilibrium. However, in less developed and developing economies like Indonesia because of the structure of the economy, most export productions are dominated by primary commodities such as rubber, mineral and petroleum whose supplies are rigidly limited in the short-run. At the same time, imports of developing countries which comprises mostly of capital goods

for economic development have been reduced minimally by the Authorities. In addition there are hardly any domestic substitute industries for imports of capital goods. Even if there were other imports, the Authorities have already used tariffs and quota in such a way where such imports of other commodities would be negligible. With this weak stimulative-forces, the depressant forces of exchange-rate changes may dominate the economy. The depressant forces are *inter alia* the effects of higher import prices and the possibility of a redistribution of real income from low savers to high savers, from wages to profits. If the economy contracts following devaluation, it is likely that profits will not rise, may be even fall, as much as by the cost of production thereby reducing investment, employment and domestic product. On the one hand, there will be an excess demand for cheaper nontraded goods (substitution-effects) thereby pushing up the rate of inflation via higher price level. On the other hand, the increased cost of imported goods due to devaluation will be transferred to domestic prices via a markup mechanism, higher cost and more inflationary expectations. Taken together these phenomenon will presurise nominal wage to rise (wage-price spiral); devaluation will leave real wages the same with that of previous devaluation because of the real wage resistance. Since real levels of investment, government expenditure and consumption are independent of the price level, then there will be no real effects resulting from the devaluation. The level of employment and production would therefore not change as a result of devaluation. A rise in the nominal exchange rate (the units of domestic currency per unit of foreign currency) would affect domestic price level. In the very short run, this would lead to an increase in the real exchange rate (the nominal exchange rate adjusted for the domestic inflation relative to the foreign inflation). This would increase the demand for nontraded products because of the substitution effects thereby aggravating the rate of inflation. This rate of inflation would be transmitted to higher price of traded goods, therefore

devaluation causes the increased money wage or price bringing the economy back to its original state. The balance of payments will stay exactly as before, only nominal magnitude will be higher. Consequently there will be no resource allocation across tradable and nontradable goods. The devaluation will be completely frustrated; the balance of payments will improve in the short-run with the cost of stagnation, greater unemployment and slower economic growth in the long-run. This argument is the heart of Structuralists (SABP, see next section) which is against devaluation policy in less developed countries since it will lead to economic hardship (such as the contractionary and an inflationary effects) thereby causing a decline in real output.

Criticism

First, the Absorption approach suffers from a methodological problem as Machlup (1955) argued that implicit theorizing grounded on purely definitional tautologies such as accounting identities 3.2.2 and 3.2.3 does not permit economists to assert that TB depends on Y and A in a causal sense. Additionally Whitman (1975) argues that the identities are not meaningful; it is imperative to know what lies behind the identities as to how variables are defined and the underlying assumptions of the model. Second, it is not a fundamentally general equilibrium model because it focuses only on the products market, and largely ignores other markets. Third, by concentrating its attention upon income and expenditure flows, it omits several important explanatory variables, such as cash balance and relative price effects. Fourth, the Marginal Propensity to Absorb (MPA) and the various direct effects are likely to vary considerably between different circumstances. Fifth, the approach is inadequate in providing a full analysis of how output and absorption change because it does not deal with the inflationary effects of the devaluation. Despite that the

approach provides a useful perspective from which to view the trade balance, however, it must be supplemented by other theories such as a theory of capital account movement for a more complete treatment of the balance-of-payments analysis.

3.3. The Monetary Approach to the Balance of Payments (MABP)

The Monetary approach literature contains many versions. It has a long intellectual history beginning with the writings of David Hume in 1870s, followed by Meade (1951), Johnson-Mundell (1967), Mussa (1974), and Frenkel (1976). Despite this diversity, the basic insight is that it brings out the real balance effect more cogently than the other approaches, concentrating on the classical role of perfectly flexible prices, wages, and full employment. The monetary implications of a country's balance of payments disequilibria (surplus and deficit) reflects imbalances between the money demand and the supply of reserves in the economy because of the monetization of domestic assets by the central bank ⁸. If the money demand increases more rapidly than the supply based on the government expansion of the domestic assets, then a nation would experience a trade and payment surplus (since the supply of goods would exceed the demand). On the other hand, a deficit in the balance of payments results from an excess in the money stock supplied that is not eliminated by the government. The approach assumes that (1) the country is small, open, and under a fixed exchange rate, (2) the output and employment tend towards a full-employment situation which is determined by real factors autonomously of monetary policy, (3) there is perfect international mobility of goods and financial assets, (4) long run equilibrium in the model requires both stock and flow equilibrium in all markets.

The theory begins by postulating that the demand for nominal money balance (M^d) is a stable function of domestic real income (Y^r), the domestic nominal interest rate (i), and the domestic price level (P). The money demand is specified to be a positive function of real income and price, and a negative function of

⁸In this study, the words of the central bank, the Authorities and the government are used interchangeably.

the opportunity cost of holding money or the nominal interest rate, mathematically as follows

$$M^d = \omega (Y^r, i, P) \quad 3.3.1$$

where $\omega'(Y^r) > 0$, $\omega'(P) > 0$, $\omega'(i) < 0$.

On the other hand, money supply (M^s) is the product of the stock of high-powered money (H^m), or

$$M^s = H^m \quad 3.3.2$$

Since the stock of high-powered money (H^m) is equal to a nation's foreign exchange reserves (R) plus the domestic assets of the central bank (D), or

$$H^m = R + D \quad 3.3.3$$

subsequently by substitution, the equation 3.3.2 changes to

$$M^s = R + D \quad 3.3.4$$

The long-run equilibrium in the money market implies that

$$M^d = M^s \quad 3.3.5$$

$$\omega (Y^r, i, P) = R + D \quad 3.3.6$$

$$R = [\omega (Y^r, i, P)] - D \quad 3.3.7$$

by taking the first differences and rearranging, 3.3.7 changes to

$$\Delta R = [\Delta \omega (Y^r, i, P)] - \Delta D \quad 3.3.8$$

Alternatively by using the above equation, the endogenously foreign exchange reserves can be specified as

$$R = \Phi (Y^r, i, P, D) \quad 3.3.9$$

The equation 3.3.8 and 3.3.9 above summarize the several basic contention of the Monetary Approach to the Balance of Payments (MABP) hypothesis. First, since the focus of the Monetary approach is on the balance of payments as a whole (current and capital account) accordingly a country's balance-of-payments disequilibrium is equivalent to a change in the level of international exchange reserves (ΔR). Those changes in the exchange reserves (that will be reflected in a surplus or a deficit) are equal to the difference between the change in the money demand [$\Delta \omega (Y^r, i, P)$] and the change in the domestic credit expansion under the central bank (ΔD). In other words, a deficit would occur only if the government let the domestic credit expand faster than the demand for money in the economy. Second, an expansion in the domestic real income raises foreign exchange reserves, while an increase in the domestic interest rate and the domestic credit expansion decrease the international reserves as the balance-of-payments worsen.

Another key characteristic of the approach is the automatic balance-of-payments adjustment mechanism; long-run stock equilibrium in the money market ensures long-run balance of payments equilibrium. Thus the balance of payments surplus or deficit is temporary and self correcting in the long run. After the excess demand for or supply of money is eliminated through an inflow or outflow of funds, the surplus or deficit is corrected and the international flow of money comes to an end. In accordance with the Monetary approach, in the long run a fixed-exchange-rate nation has no control over its total money supply. The approach does not consider a country's sterilization policy feasible in a world of integrated financial markets and a high volume of interest sensitive international capital flows (it is assumed that the government cannot engage in the sterilization operation). Any attempt by the central bank to increase the total money supply (M^s) in the face of an unchanged demand for money (M^d) will simply lead to the outflow of the country's excess money supply and a reduction in the

international reserves (R). In the long run the effect of attempting to increase the total money supply (lax monetary policy for example) will simply change the composition of a nation's monetary base; it will increase D , however, this will not lead to an equal reduction in R without any changes in the country's total monetary base ($D+R$). Similarly an attempt to reduce total money supply by reducing bank credit (tight monetary policy for example) in the face of unchanged the money demand (M^d) will result in an equal increase in the reserves (R) leaving the total monetary base and total money supply completely unchanged in the economy. The approach considers that the conventional devaluation policy can only affect its balance-of-payments position through their effects on the demand for and the supply of money. The devaluation will only have a short term impact in the balance of payments; it is seen by the Monetary approach as essentially a temporary substitute for monetary contraction. The devaluation will also reduce the real value of a country's nominal money balances through an increase in the domestic price level, and may result in a transitory impact on the balance of payments, but cannot achieve a permanent effect. The reasons are firstly, because of the high substitutability between traded goods in international markets, a small-open country is a price taker and its prices level is determined by the level of world prices hence the devaluation cannot affect the relative prices, secondly, the devaluation cannot improve its balance of payment permanently because any increase in the demand for money following the devaluation will be matched by an equal rise in the supply of money through an accumulation of the reserves; prices and the stock of money rise in proportion leaving its balance of payments unchanged. Thus the devaluation is ineffective and counterproductive; it is enough to leave the economy to its own devices for everything to be accommodated automatically (automatic adjustment mechanism).

Criticism

First, the automatic tendency toward long-run equilibrium in the market can be questioned. It does not seem permissible to assume that it does exist specifically in a developing economy where there is a huge degree of market failure and underdeveloped assets and monetary markets. Second, two essential elements of the approach, the stability of the money demand and the direct link between the balance of payments and its total money supply, may be questioned too. Many economists would question its realism. Third, although the monetary approach is useful in showing that balance-of-payments disequilibria do have monetary consequences, and in helping to understand the process of balance-of-payments adjustment. This approach does not establish whether a deficit (surplus) have anything to do with an excess supply of (demand for) money in a causal context. For this reason, the specific emphasis on monetary disequilibrium may be misplaced. In the case of deficit for example, the Monetary approach does not determine whether deficit arises from an excessive absorption by domestic residents or from the inhabitants increasing their stock of foreign bonds. Fourth, the approach assumes away the problem of unemployment, which are clearly issues of great importance in economics, particularly in a developing economy where unemployment does exist.

3.4. The Capital Market Approach to the Balance of Payments (CMABP)

The Capital Market approach or portfolio balance model originates by Kouri-Porter (1974). It is a synthesis of the Branson (1968) model of portfolio selection and the MABP theory developed by Mundell (1968) and Johnson (1972b). Kouri and Porter argue that the dependent variable in the MABP model (equation 3.3.8) is mistakenly defined as the changes in reserve (ΔR). Further, they assert that the only balance-of-payments transactions caused by an excess money demand is an inflow of private capital, while an excess money supply creates an outflow. Thus, the dependent variable of 3.3.8 should be the changes in capital flow (K) rather than the changes in reserve (ΔR). The Capital Market approach is different with the Monetary approach in that it does not focus its attention to just one asset, namely money, instead it recognizes that the demand for and supply of not only money but also all other assets (assuming all other assets to be perfect substitute) have to be taken into account in analysing the balance of payments. It views assets movements as a mechanism for eliminating excess supply of or demand for money. Consequently the balance of payments disequilibrium may follow from changed supply or demand conditions for foreign and domestic assets as well as changes in money markets conditions; the balance of payments equilibrium is a result of a range of prices that equalizes the demand for and supply of the broad spectrum of all assets which comprise monies and wealth portfolios in the economy.

The CMABP ⁹ hypothesis propounds that the flow of capital in the economy occurs via adjustments in the financial sectors which consists of four functions as follows

⁹The CMABP approach assumes that (1) changes in income, prices, and the stock of wealth are exogenously given, (2) monetary factors are not permitted to influence the real variable; neutral monetary policy, (3)

•demand for base money

$$M^d = f1 (Y^n, W, i, i^*, \rho) \quad 3.4.1$$

where $\partial f1/\partial Y^n$; $\partial f1/\partial W > 0$ and $\partial f1/\partial i$; $\partial f1/\partial i^* < 0$

•demand for domestic assets

$$A^d = f2 (Y^n, W, i, i^*, \rho) \quad 3.4.2$$

where $\partial f2/\partial i$; $\partial f2/\partial W > 0$ and $\partial f2/\partial Y^n$; $\partial f2/\partial i^* > < 0$

•demand for world assets

$$A^{*d} = f3 (Y^n, W, i, i^*, \rho) \quad 3.4.3$$

where $\partial f3/\partial i$; $\partial f3/\partial W > 0$ and $\partial f3/\partial i < 0$; $\partial f3/\partial Y^n > < 0$

•world demand for domestic assets

$$A^{d*} = f4 (Y^{n*}, W, i, i^*, \rho) \quad 3.4.4$$

where $\partial f4/\partial i$; $\partial f4/\partial i^* < 0$ and $\partial f4/\partial Y^{n*}$; $\partial f4/\partial W^* > < 0$

Where A^d stands for demand for domestic assets, A^{d*} for world demand for domestic assets, A^{*d} for demand for world assets, i for domestic interest rate, i^* for world interest rate, M^d for nominal money demand, W for domestic wealth, W^* for world wealth, Y^n for domestic nominal income, Y^{n*} for world nominal income, ρ ($\rho = \xi^e - \xi$) for a measure of risk, ξ for exchange rate or domestic value of foreign currency, and ξ^e for expected exchange rate. Further, The CMABP approach assumes that (1) changes in income, prices, and the stock of wealth are exogenously given, (2) monetary factors are not permitted to influence the real variable; neutral monetary policy, (3) changes in real variables and domestic component of the monetary base will cause portfolio substitutions which lead to capital flows and changes in domestic interest rate, (4) there

changes in real variables and domestic component of the monetary base will cause portfolio substitutions which lead to capital flows and changes in domestic interest rate, (4) there are only three types of financial assets in the economy, namely, base money, domestic and foreign assets, (5) expectations regarding price level and exchange rate are stationary, (6) domestic economy is small such that the world supply of world assets is infinitely elastic at the foreign interest rate, and (7) there is a perfect capital mobility among countries.

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The assumption of perfect capital mobility causes the demand and supply equations of the asset markets drop out, subsequently the portfolio-balance model is condensed into the functions which is a simple monetary model of an open economy as follows

$$M^d = f_1(i^*, Y^n, W, \rho) \quad 3.4.5$$

$$M^s = D + F \quad 3.4.6$$

$$\Delta F = CB + K \quad 3.4.7$$

$$M^s = M^d \quad 3.4.8$$

The supply of base money is a function of the flow of central bank's world assets and domestic assets, algebraically as

$$M^s = D + F \quad 3.4.9$$

$$\Delta D = -\Delta G^b \quad 3.4.10$$

$$\Delta F = K + CB \quad 3.4.11$$

$$K = \Delta A^{d*} - \Delta A^{*d} \quad 3.4.12$$

where M^s stands for money supply, CB for current balance, K for private capital inflows, D for domestic assets of the central bank, Δ for first-difference operator, F for foreign assets of the central bank, and G^b for government bonds in the private sector.

The real sectors of the economy, namely income (Y^n), price level (P) and current balance (CB), are exogenously given, as are the domestic wealth (W) and foreign wealth (W^*) which serve as portfolio constraints formally as follows

$$\partial f_1/\partial W + \partial f_2/\partial W + \partial f_3/\partial W = 1 \quad 3.4.13a$$

$$\partial f_1/\partial Y^n + \partial f_2/\partial Y^n + \partial f_3/\partial Y^n = 0 \quad 3.4.13b$$

$$\partial f_1/\partial i + \partial f_2/\partial i + \partial f_3/\partial i = 0 \quad 3.4.13c$$

$$\partial f_1/\partial i^* + \partial f_2/\partial i^* + \partial f_3/\partial i^* = 0 \quad 3.4.13d$$

Equating $M^d=M^s$, taking the first-difference operation of the equations 1.1, 1.9, 1.10 then rearranging, it yields

$$\Delta f_1 (Y^n, W, i, i^*, \rho) = \Delta D + CB + K \quad 3.4.14$$

$$K = \Delta f_4 (Y^{n*}, W, i, i^*, \rho) - \Delta f_3 (Y^n, W, i, i^*, \rho) \quad 3.4.15$$

Applying the portfolio constraints (equations 3.4.13a to 3.4.13d) and solving the system for capital movements (K) as a dependent variable, the result is the Capital or portfolio-balance model of 3.4.16, 3.4.17a, 3.4.17b and 3.4.17c as follows

$$K = - (\partial f_2/\partial i + \partial f_4/\partial i)^{-1} \{ [(\partial f_3/\partial i - \partial f_4/\partial i) \partial f_1/\partial i^* + (\partial f_4/\partial i^* - \partial f_3/\partial i^*) \partial f_1/\partial i^*] \Delta i^* + [(\partial f_3/\partial i - \partial f_4/\partial i) \partial f_1/\partial Y^n - (\partial f_1/\partial i) (\partial f_3/\partial Y^n)] \Delta Y^n + (\partial f_4/\partial i - \partial f_3/\partial i) \Delta D + (\partial f_4/\partial i - \partial f_3/\partial i) CB + [(\partial f_3/\partial i - \partial f_4/\partial i) \partial f_1/\partial W - (\partial f_3/\partial W \partial f_1/\partial i)] \Delta W + (\partial f_1/\partial i) (\partial f_4/\partial Y^{n*}) \Delta Y^{n*} + (\partial f_1/\partial i) (\partial f_4/\partial W^*) \Delta W^* \} \quad 3.4.16$$

$$K = \tau_{10} + \tau_{11} i^* + \tau_{12} \Delta Y^n + \tau_{13} \Delta D + \tau_{14} CB + u_{10} \quad 3.4.17a$$

Equation 3.4.17a contains the fundamental argument of the CMABP hypothesis whereby the testable ¹⁰ explanatory variables in the model are changes in domestic income, the current balance, changes in domestic monetary instruments, and changes in world interest rate.

¹⁰Testable here means observable. While theoretical structure of the model is well-established, a number of problems are encountered when the variables are translated into observable data. Several variables such as differential risk, expected rate-of-return and expected exchange-rate are not immediately observable. Not to mention, the lack of data on the domestic and world wealth.

A major problem in the empirical analysis of capital movements is the proper specification of a risk factor. In a system of floating rates, exchange-rate risk and speculation may be estimated directly by adopting a model of expectation formation as central to the explanation of equilibrium in the balance of payments. However in a pegged-rate system like Indonesia, this would be implausible since the model would determine forward exchange rates; the forward exchange rate itself is pegged and determined by the Authorities! This formation of exchange-rate expectation which incorporates an intervention band is particularly difficult to formulate in an econometric model so as to have empirical applicability. For example Kesselman (1971) and Artus (1976) attempted to estimate the exchange-rate expectation function but they had little success. There are a number of difficulties in deriving a testable expectation hypothesis that could describe the behaviour of speculators in the system of fixed parities. Usually in the first case the exchange-rate expectation variable is dropped by imposing the assumption of static expectation. In the second case, the exchange-rate expectation variable may be substituted by a proxy variable. Thus, instead of incorporating a specific model of expectation formation, actual exchange-rate changes (3.4.17b) or dummy ¹¹ (3.4.17c) variable may be used as proxy measures of risk and speculative activity. Exchange-rate changes may be used as a proxy because a change in exchange rate or devaluation would lead to capital outflows by investors (in search of lower risks and speculative activity) due to the fear of further devaluation.

$$K = \tau_{20} + \tau_{21} i^* + \tau_{22} \Delta Y^n + \tau_{23} \Delta D + \tau_{24} CB + \tau_{25} \Delta \xi + u_{20} \quad 3.4.17b$$

$$K = \tau_{30} + \tau_{31} i^* + \tau_{32} \Delta Y^n + \tau_{33} \Delta D + \tau_{34} CB + \tau_{35} D + u_{30} \quad 3.4.17c$$

¹¹The difference between expected and actual exchange rates may be substituted by dummy variables. The dummy variable is assigned to be positive in the case of speculative capital inflows and negative in the case of speculative outflows.

where the priors for the expected signs are as follows, $\tau_{11,21,31} < 0$, $\tau_{12,22,32} > 0$, $\tau_{13,14,23,33,24,34} < 0$, $\tau_{25} < 0$, and $\tau_{35} < 0$. An increase of foreign interest rate will decrease the inflow of capital and as long as foreign rates remain high relative to domestic rates the decreased inflow would continue. An increase in domestic income will decrease the demand for bonds since it raises the demand for money which is partially fulfilled by an increased inflow of capital. There is a negative association between private capital inflows and domestic credit or current balance. The offset coefficient is expected to vary, from zero to unity, according to the degree of capital mobility. When the coefficient equals one, there is perfect capital mobility. A reduction in the nominal value of domestic currency, devaluation for example, would stimulate capital flight. Equation 3.4.17a, 3.4.17b and 3.4.17c can be used to simulate macro policy advice since it contains the instruments of monetary policy as regressors.

Criticism

The Capital Market or Portfolio Balance approach demonstrates a significant progress on the balance of payments theory since it has general equilibrium properties where money and asset movements are taken into consideration within the context of the nation's balance of payments. The forces of world exchange flows on domestic monetary economy is also considered. However, there are a number of criticisms which need to be resolved. First, the stringent assumptions may not be applicable to developing countries where the money and asset markets are not yet developed. Second, the approach which concentrates mainly in the asset markets ignores important influences not contained in the assets demand and supply functions; it disregards, as the other approaches do, the government reaction policy in building the model. Third, further problems involve the assumptions of perfect capital mobility

and the immediate adjustment between domestic and foreign interest rate. The assumptions are mostly not satisfied in a developing economy. Under the conditions of less than perfect capital mobility, the model is not useful in tracing the adjustment process between asset markets at home and abroad. Further the view that the money demand is a function of the world interest rate (because of the above adjustment) is debatable on theoretical grounds.

3.5. The Structural Approach to the Balance of Payments (SABP)

While the four alternative approaches (EABP, AABP, MABP and CMABP) analyses balance of payments separately, the more recent analysis namely the Structural Approach to the Balance of Payments has gained applicability particularly for less developed countries. The structuralist literature on balance of payments in this context has been dominated by two major schools of thought, namely firstly, balance of payments can be seen in the context of the "stages of growth" theory, secondly, balance of payments can be seen in the context of "pure structuralist" theory or "structuralist" for short.

The "stages of growth" theory views the balance of payments in the terms of its development. The process of balance of payments development can be seen as a series of successive stages through which all nations must pass. This theory borrows heavily from the "economic development" theory (in which the right quantity and mixture of saving, investment, and foreign aid were necessary to enable nations to proceed along the lines of economic growth (starting from an under-developed economy to a developing economy to a developed economy). *Inter alia*, Rostow's (1960) stage theory of economic growth maintains that all economies are located in one of the hierarchy of developmental stages, namely (1) the traditional stage, (2) the transitional stage or the pre-condition for take-off stage, (3) the take-off stage, (4) the drive-to-maturity stage, and (5) the high-mass-consumption stage. Industrial countries such as USA, UK are identified as those which have passed via the stage 4 and 5. Accordingly the balance of payments development becomes synonymous with economic growth, and stages in the balance of payments development may be classified "young debtor" stage, "growing debtor" stage, finally "mature debtor" stage. This "balance-of-payments stage" theory is basically based on the experience of industrialized countries. It fits industrialized countries debt

period into a balance of payments stage theory (see for example Galbraith-Heilbroner 1985, Nafziger 1990). The idea behind the theory is that foreign loans enable a country to spend more than it produces, to invest more than it saves, and to import more than it exports, however, the borrowing country must service the foreign debt by experiencing certain stages in the balance of payments development.

Alternative and recent views of the balance of payments can be seen in the context of "structuralist" theory. It has become commonplace in the literature on balance of payments development to describe less developed countries as dependent economies. The condition of dependency encompasses the following major features, firstly, LDCs have inherited particular structures of production and trade especially the production of primary commodities for exports. Secondly, as a result of industrial development, less developed countries are heavily dependent on imports of capital, foreign technology and manufactured goods. "Structuralist" theory itself originated in Latin America by Prebisch (1950, 1959). The starting point was the idea that that a nation's economy was composed of two poles, the "centre" (the centre whereby a few manufacturing production is concentrated) and the "periphery" (the periphery which was destined mainly to produce primary products such as agricultural and mineral) in which the structure of production in each differed substantially. In general, the economies are poorly integrated. From this, it follows that that a significant proportion of the demand for capital, manufactured products, machinery and foreign technology for economic development are oriented toward imports. Given that, their income elasticity is greater than unity, imports tend to grow faster than the level of real income. Whilst exports consist essentially of primary products for which income elasticity of exports demand is low (less than unity) hence they grow less rapidly than real income. This disparity between the income elasticities of imports and exports will impose a limit upon rate of growth of real income

in the economy thereby incurring successive deficits in the balance of payments.

This structuralist condition can be derived algebraically in the following paragraph. The import demand curve (M^d) is specified to be a function of the relative import prices (P^m) and domestic real income (Y^r) algebraically as

$$M_t^* = \Phi_1 (P^m_t, P_t, Y^r_t) \quad 3.5.1$$

$$M_t^* = \Phi_2 (P^m_t / P_t, Y^r_t / P_t) \quad 3.5.2$$

To fit the above relationship statistically, the log-linear form is chosen as follows

$$M_t = \alpha_{10} (P^m/P)_t^{\alpha_{11}} (Y^r/P)_t^{\alpha_{12}} e^{u_{1t}} \quad 3.5.3$$

$$\ln M_t = \alpha_{10} + \alpha_{11} \ln P^m_t + \alpha_{12} \ln Y^r_t + u_{1t} \quad 3.5.4$$

$$m_t = \alpha_{10} + \alpha_{11} p^m_t + \alpha_{12} y^r_t + u_{1t} \quad 3.5.5$$

where $m_t = \ln M_t$, $p^m_t = \ln P^m_t$, and $y^r_t = \ln Y^r_t$ (lower case values indicate logarithm to the base e variables), α_{11} is long-run (LR) price elasticity of import demand, and α_{12} is LR income elasticity of import demand.

The world demand for exports (X^d) is specified as a function of the relative price of exports (P^x) and real world income (Y^{r*}) formally

$$X_t^d = \Phi_4 (P^x_t, P^*, Y^{r*}_t) \quad 3.5.6$$

$$X_t^d = \Phi_5 \{ (P^x/P^*)_t, (Y^{r*}/P^*)_t \} \quad 3.5.7$$

$$X_t^d = \beta_{10} (P^x/P^*)_t^{\beta_{11}} (Y^{r*}/P^*)_t^{\beta_{12}} e^{u_{17t}} \quad 3.5.8$$

$$x_t^d = \beta_{10} + \beta_{11} p^{rx}_t + \beta_{12} y^{r*}_t + u_{17t} \quad 3.5.9$$

where $x_t^d = \ln X_t^d$, $p^{rx}_t = \ln P^{rx}_t$, $y^{r*}_t = \ln Y^{r*}_t$, β_{11} is LR price elasticity of import demand, and β_{12} is LR income elasticity of import demand.

The structuralists maintain three tendencies which are considered inherent to the development of the economy namely deterioration of the terms of trade, balance of payments disequilibrium and unemployment. There is basically a demand and a supply element behind the tendency of deterioration to the terms of trade. From a demand point of view (given the differences in income elasticities for imports and exports demand) the "absorption path" is biased toward trade, as income grows the proportion of importables in total absorption increases. From the point of view of supply (given the state of technology and the low price elasticity of export supply) the "production path" is biased toward trade as output grows the proportion of exportables in domestic production decrease. The combined effect therefore would be a tendency towards an increased demand for imports of manufacturing goods and an increased export supply of primary products, however the increase in those for imports is considerably larger than those for exports. This would tend to push up prices of imports and push down prices of exports in the economy; thus the tendency towards deterioration of the terms of trade as the economy grows. From the balance of payments perspective, deficits in less developed countries are due mainly to the following

$$\partial m^d_t / \partial y_t > \partial x^d_t / \partial y^{*}_t \quad 3.5.10$$

$$(m_t - m_{t-1}) (m_{t-1})^{-1} > (x_t - x_{t-1}) (x_{t-1})^{-1} \quad 3.5.11$$

$$\partial x^s_t / \partial y_t < 1 \quad 3.5.12$$

$$\partial m^d_t / \partial p^m_t < 1 \quad 3.5.13$$

Equation 3.5.10 analyzes the well-known Houthakker-Magee effect whilst equation 3.5.11 analyzes the failure of exports to stimulate growth ($\partial x^s_t / \partial y_t < 1$) because of the long run temporal decline in the terms of trade between primary products and manufactured goods and the consequent need for industrialization behind protective barriers (from an outward orientated to an inward orientated development). The failure of

import substituting industrialization strategy in less developed countries ($\partial m^d_i / \partial p^{rm}_i < 1$) has led to the realisation that the forms of dependency may have changed but the essential condition has not been eliminated. The only long-term alternative will be an increased effort to satisfy the highly income elastic demand for manufactured products with internal production and to diversify its export trade toward income elastic products. According to structuralists, it is possible to break the vicious circle via a process of transformation of the economic structure. The central element in this structural transformation is the process of industrialization which could provide those highly income elastic importables and also produce more price elastic exportables. Only a process of industrialization can allow that and enable the the balance of payments to grow. However, this process of industrialization also generates a need for imports which can exceed the availability of foreign currency deriving from the slow expansion of primary exports. There is a role for foreign capital, debt and loans in remedying the shortage of foreign currency and to complement internal investments.

Suppose the economy is divided by n sectors, a measure of structural change is the summation of absolute values of changes in the proportions of the different sectors consequent upon 1 per cent change in per capita income algebraically as

$$\sum \{ \partial (SQ_i / GDP) (\partial x)^{-1} \} x \quad 3.5.14$$

where SQ_i is value added in any sector, x is per capita income.

In developing economies, primary production is the highest contributor to structural change. During the stages of balance of payments development, the value added in primary production (agriculture, oil, timber etc) as a proportion of total GNP goes down whereas in other sectors (commerce, manufacturing, minning, services, construction, transportation, communication, energy etc) particularly manufacturing

production goes up. However this process could not be expected to take place spontaneously, for it would be inhibited by a series of structural obstacles to the economic development. A series of measures may be proposed to promote a process of industrialization including government intervention in the formulation of economic policies and as a direct productive agent. Among the economic policies suggested were those of protectionism, exchange controls, the attraction of foreign capital into manufacturing and the stimulation of domestic investments particularly export oriented investments.

The SABP emphasizes the problems of microeconomic and supply side elements to deal with structural obstacles such as severe distortions in costs and prices, inadequate saving and investment, and inefficient nonfinancial public enterprise. The superiority of the SABP over the other approaches is that the approach is not only exclusively concentrated on the money, financial and real sides of the economy but also it emphasizes structural aspects as well as the supply side as the origin of the economic problems in less developed countries. In addition, the SABP maintains that the only strategy that can improve a nation's balance of payments in the long-run is to undergo structural change ¹² such as a change in the relative weight in the significant components of exports and imports, of the national product and expenditure, and of population and the labour force. It is a complex phenomena involving structural change in the various aspects of consumptive and productive forces through organizational and institutional changes in the

¹²When the economy is in a low income stage and the economic as well as organizational structures are correspondingly at low levels, the resource-allocation function of the market economy is weak in which transaction costs are high to more than counterbalance the gains obtainable from participating in them. If succesful, the structural change will contribute for economizing transactions cotst and for infussing competitive pressure into the economy.

economy of less developed countries ¹³. In contrast to the Elasticities Approach (EABP), most structuralists (for example see Taylor 1974, 1979 and Schydrowsky 1979) agree to the "old" view that devaluation is not only inflationary but also ineffective in correcting the balance of payments due to, firstly, low trade elasticities (imports and exports are unresponsive to the exchange rate), secondly, a fall in the real output (higher prices following devaluation decrease purchasing power and effective demand in the economy). In a nutshell, the structuralist view can be illustrated in the figure 3.6.1 below.

Figure 3.6.1
Trade as an Engine of Balance of Payments Growth



Criticism

Firstly, despite the widespread popularity of Rostow's theory, it has also attracted a good deal of criticism. For example, in the absence of any clear distinction between the end of one phase and the beginning of the next phase, the theory becomes tautological (the rich countries have by definition achieved the transition from traditional to maturity stage, whereas the less developed countries fail to accomplish the transition or achieve take-off). Secondly, the theory originated in industrialized economies. Most evident in the balance of payments stage theory that underdeveloped countries are in the

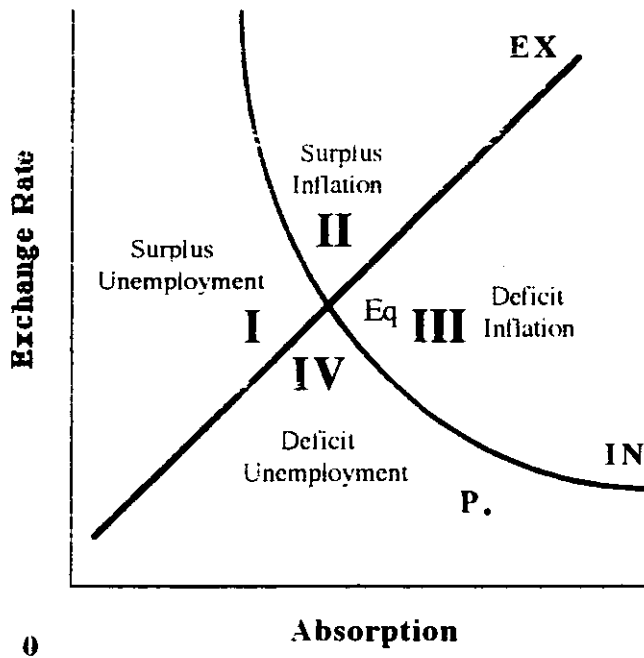
¹³These changes tend to promote specialization of production units and strengthen cooperation which creating internal and external economies.

early stages of a development process similiar to that undergone by industrialized nations. It is however obvious that the problem of a highly populated developing country like Indonesia differ from those of industrialized nations. The economic environment of underdeveloped countries is now operating appreciably different from that sorrounding the industrialized economies at a comparable stage. For example in considering the role of capital formation on economic growth, it may be feasible in the industrialized economies to assume that adequate supplies of skilled manpower and technology, in Indonesia it is probable that the capacity to absorp capital is limited by shortage of manpower and the need of importing technology and machinery for the economy development. In addition because of disguised unemployment, the exports sector is in position to develop rapidly subject only to its rate of capital accumulation. Thirdly, a more fundamental problem for the theory of balance of payments development is the failure to agree on a readily measurable definition of what balance of payments development is. Although the development may be perceived in terms of the improvement of several key indicators, the problem arises from the lack of any consensus potraying which indicators should be selected as the key ones.

3.6. Balance of Payments Policies in a Fixed Exchange Rate System

The economic objectives of a nation are external balance (equilibrium in the balance of payments), internal balance (the achievement to full-employment and price stability), economic growth and distribution of income. To achieve these objectives, a country has the following macroeconomic policy instruments: expenditure changing policy (expenditure changing policy refers to both fiscal and monetary policies; fiscal policy refers to changes in government expenditures and taxes whereas monetary policy refers to changes in the country's money supply and affects domestic interest rates), expenditure switching policy (changes in the exchange rate; devaluation or revaluation) and direct control (tariffs, quotas, and other restrictions on the flow of international trade). The working of monetary and fiscal policy above can be explained by using Swan (1963) diagram (figure 3.6.1) in which the vertical axis measures exchange rate and the horizontal axis shows the level of domestic absorption. IN gives all possible combination of government expenditure and exchange rate for internal equilibrium whilst EX gives those for external equilibrium. The IN line slopes downward to the right because at a high level of absorption, the exchange rate must be low and cause only a low level of injection into the expenditure stream in the form of net exports in order to maintain equality of injections and leakages at full employment. Contrary, at a low level of absorption, internal balance is attained by having an exchange rate at which exports are greater and imports are smaller. The EX line slopes upward to the right because at a low level of absorption, the equilibrium level of income and imports are low. Contrary, the higher level of absorption, the higher the equilibrium income and imports. A nation can simultaneously attain internal and external balance with expenditure changing and expenditure switching policies.

Figure 3.6.1
The Swan Model

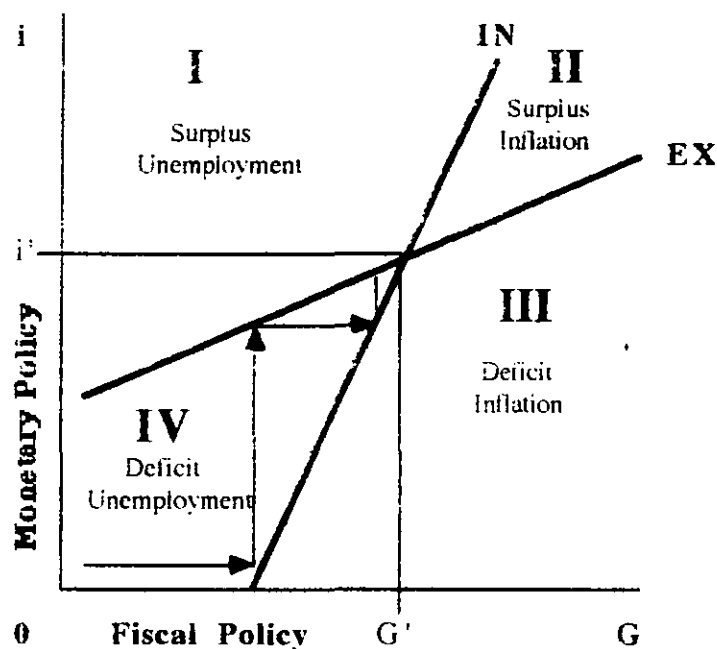


In figure 3.6.1, a country will be simultaneously in both internal and external balance only at point Eq, where the EX and IN curves intersect. A nation can determine the combination of expenditure changing and expenditure switching policies required to reach point Eq.

However, this above analysis may result in a theoretical problem. For example if a nation wrongly uses monetary policy to attain internal balance and fiscal policy to attain external balance, a nation can move further away from equilibrium, point Eq (see figure 3.6.2). Mundell (1962, 1963), however, was able to reconcile the conflict between internal and external balance by using the "Principle of Effective Market Classification" that a nation can use fiscal policy to attain internal balance and monetary policy to attain external balance (table 3.6.1). For example, starting from any point in zone IV, a nation should employ expansionary fiscal policy to reach internal balance (the IN line), and then tight monetary policy to

reach external balance (the EX line) on its way to point E_q (see arrow).

Figure 3.6.2
The Mundell-Fleming Model



In figure 3.6.2, EX is the external balance curve which traces the combinations of the domestic interest rate and the budget surplus along which the balance of payments is in equilibrium. It is negatively sloped because rising interest rate will attract capital inflows and for the balance of payments to be in equilibrium the budget surplus must fall. IN is the internal balance curve. It traces the combinations of interest rate and the budget surplus in which there is full employment. It is negatively sloped because tighter monetary policy must be offset by tighter fiscal policy to remain on the curve.

Table 3.6.1
Monetary and Fiscal Policy

Problem	Monetary Policy	Fiscal Policy
Unemployment & Deficit	Contractionary	Expansionary
Unemployment & Surplus	Expansionary	Expansionary
Inflation & Deficit	Contractionary	Contractionary
Inflation & Surplus	Expansionary	Contractionary

The fundamental point is which macroeconomic policy to assign to which economic objective (the so called "the assignment problem"). The allocation of policy instruments to targets becomes empirical depending upon the sensitivity of targets to instruments. Assuming two economic targets (T_1 and T_2) and two macroeconomic policies (P_1 and P_2), it yields two structural relationship of 3.6.1 and 3.6.2. The Principle Effective Market Classification maintains assign P_1 or P_2 to T_1 according whether $\theta_{11}/\theta_{21} > < \theta_{12}/\theta_{22}$. The macro policy not assigned to T_1 is then assigned to T_2 .

$$T_1 = \theta_{11} P_1 + \theta_{12} P_2 \quad 3.6.1$$

$$T_2 = \theta_{21} P_1 + \theta_{22} P_2 \quad 3.6.2$$

In order to show how fiscal and monetary policies can be used to achieve internal and external balance, some additional tools of economic analysis are needed namely the IS curve, the LM curve and the BP curve. The IS curve indicates the various combinations of interest rates and income that results in equilibrium in the goods market. It is negatively sloped because *ceteris paribus* lower rates of interest (higher investments) are associated with higher income. Equilibrium in the goods market occurs where the sum of the injections of investment (I), fiscal policy (G) and exports (X) equals the sum of leakages of saving (S) and imports (M) algebraically as follows :

$$I(i) + G + X(R) = S(Y) + M(Y, R) \quad 3.6.3$$

where $\partial I/\partial i > 0$, $\partial X/\partial R > 0$, $\partial S/\partial Y > 0$, $\partial M/\partial Y > 0$, and $\partial M/\partial R < 0$

I stands for investments, i for domestic interest rate, G for fiscal policy or government expenditure, S for saving, Y for domestic income or output, M for imports, X for exports, R for international reserves.

The LM curve shows the various combinations of interest rates and income at which the money demand is equal to the money supply (equilibrium in the money market). To be in equilibrium in the money market, the transaction demand for money ($M^{d_{tr}}$) plus the speculative demand for money ($M^{d_{sp}}$) equals to the money supply (M^s) which is determined by the Authorities as a monetary policy or algebraically as follows

$$M^{d_{tr}}(Y, R) + M^{d_{sp}}(i) = M^s \quad 3.6.4$$

where $\partial M^{d_{tr}}/\partial Y > 0$, $\partial M^{d_{tr}}/\partial R > 0$, and $\partial M^{d_{sp}}/\partial i < 0$.

The BP curve shows the various combinations of interest rates and income at which the balance of payments is in equilibrium at a given exchange rate. It is a positively sloped because higher incomes (and imports) require higher rate of interest (and capital inflows) to remain in balance of payments equilibrium. To be in equilibrium in the balance of payments, the balance on net short-term international capital flows (K^{st}) equals to the trade balance in the absolute and opposite terms algebraically as follows :

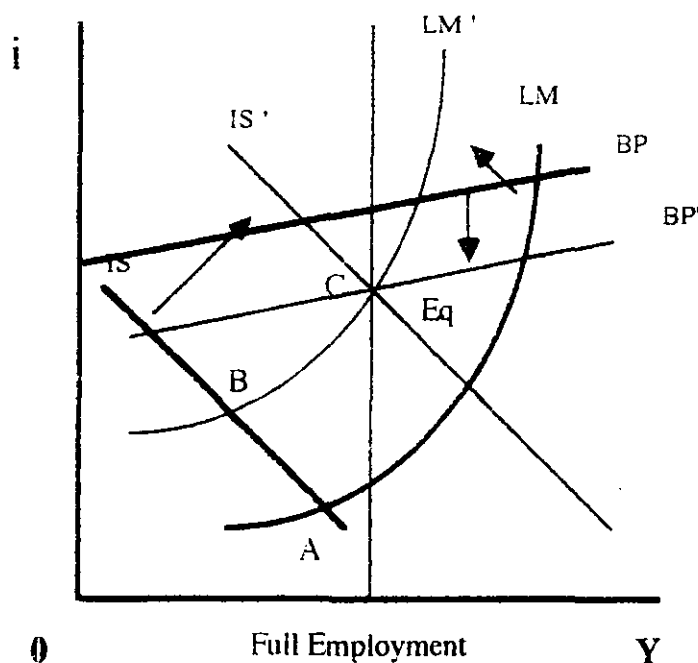
$$K^{st}(i) = TB(Y, R) \quad 3.6.5$$

where $\partial K^{st}/\partial i > 0$, $\partial TB/\partial Y < 0$, and $\partial TB/\partial R > 0$.

Thus, the above IS-LM-BP curves show the various combinations of interest rates and income at which the goods market, the money market and the balance of payments are in equilibrium. Given the value of policy variables (G and M^s), the equilibrium value of Y , i and R can be determined. The IS-LM-BP model has the advantage over the others because the goods and money markets are integrated so fiscal policy has interest rate

effects. A country would be simultaneously in equilibrium in the goods market, money market and the balance of payments at the point here the IS, LM and BP cross. The slope of the BP curve is determined by the magnitude of the marginal propensity to import and the interest sensitivity of capital movements. In reality, the Authorities cannot be sure how are the IS, LM and BP curve sloped and the precise location of the curves in the axis. The effectiveness of policy instruments depends on the slope and elasticity of the curves; there is a role for econometricians in estimating the position and the slope of the curves. However the current states of the balance of payments, the level of national income and the rate of interest can be indicative as the directions for the assignment problem.

Figure 3.6.3
The IS-LM-BP Model



The horizontal axis shows the effect of fiscal policy by the level of government expenditure whereas the vertical axis shows the effect of monetary policy by the level of domestic interest rate. The slope of BP schedule reflects the role of

international capital flows as a rise in the nation's interest rate will cause domestic and foreign assets holder to shift portfolios towards domestic securities. This increased export of securities would cause inflows of capital thereby improving the external balance.

With the problems of unemployment, balance of payments deficit and domestic price stability. Indonesia can reach full employment and balance of payments equilibrium by moving BP schedule downward to BP' (devaluation policy). The purposes of devaluation policy is to give price incentives in domestic currency to factors of production in the traded sector. The price incentive is expected to encourage the movement of factors from the non-traded to the traded sector thereby making the structure of the economy more efficient. However the cost of devaluation policy in the context developing countries like Indonesia would be inflation ! The reasons were that the publicity of devaluations might cause a greater price responsiveness, following devaluations producers may take the opportunity of raising prices of all goods thereby leading to high wages; a cost-push spiral. This could sharply diminish the "real" exchange rate changes that results from "nominal" exchange rate changes thereby simply reducing the power of a devaluation policy. In order to sustain price levels or to keep real wages low enough, the Authorities have to commence a tight monetary policy in the form of a decrease in the domestic credit expansion ¹⁴ and or an increase in the interest rates (shifting the LM curve to the left). As in the case of Indonesia, capital flows are responsive to interest rate movement (see chapter 6.4) therefore the BP curve is elastic although not horizontal. In addition, the elasticity of BP curve is greater than the LM curve (see empirical evidence on chapter 6). The

¹⁴In a fixed exchange rate system like Indonesia, money supply or domestic credit expansion was not fully exogenous: domestic credit expansion, for example, would be offset by monetary flows resulting from the balance of payments thereby leading to a deficit.

more elastic the BP, the more difficult to offset the external monetary effects. Since the BP curve is not infinitely elastic, monetary policy (by setting high domestic interest rates) can be used to attract capital inflows thereby correcting a deficit in the balance of payments. As long as domestic interest rates continued high relative to world rates, the capital account would indicate a reduced deficit, thus directing foreign resources toward expanding the economy. However, high domestic interest rate would suppress private investment leading to unemployment. Therefore the Authorities have to supplement it by using expansionary fiscal policy in the form of an increase in the government spending (shifting the IS curve to the right). Fiscal policy is powerful because the elasticity of LM is less than BP, whereas monetary policy can also be used since the BP curve is not infinitely elastic (although fiscal policy in this case is more powerful than monetary one ¹⁵). Other policies suggested by Bird (1985) in "Balance of Payments Policy in Developing Countries" are *inter alia* exchange controls as a short-term solution, export taxes to reduce the profitability of some export production, and wage policy to dampen the inflationary effect of devaluation. Evaluating the balance of payments policy suggested against the benchmark of IMF conditionality (for a more comprehensive survey, see Woo-Nasution 1989, Booth-McCawley 1981 and Sutton 1985), the IMF conditionality had a positive effect since they were already part of the policy suggested and the Development Plan undertaken. The IMF imposed several conditions among which were the commitment of a single exchange rate, trade liberalization and financial discipline. Under the IMF stabilization programme, the government agreed to the commitment of the floating rupiah and elimination of the multiple exchange rate system. The liberalization followed as a

¹⁵Because the interest elasticity of demand for money is low, the income elasticity of demand for money is high, the marginal propensity to import is high, and the interest sensitivity of capital movement is high (Llewellyn 1980).

result of the commitment of a single exchange rate. As a consequence of the liberalization, Indonesia started to gain credibility in the international community. The IMF has played an active role in helping to finance the structural and balance of payments adjustment needed in Indonesia after the 1965 revolution. Subsequently during this period the government welcomed foreign investment by enacting a 1967 Foreign Investment Law and a 1968 Domestic Investment Law which offered attractive incentives to foreign investors. Several years following the Foreign Investment Law, over US\$ 7.7 billion of foreign investment known had been approved, and private capital inflows were considerable. The economy began to grow while the receipts increased substantially due to an improved tax collection and an increase in foreign investments. The IMF financial discipline (such as management of domestic credit or a tight monetary policy for example) would provide protection against "inflation pass-through" effect of devaluation or to sustain domestic price changes due to devaluation (see chapter 6.1). Hence inflationary effects could not counteract the price advantages that the devaluation is designed to give domestic product in the foreign and domestic market. In fact some economists suggest the Authorities to maintain continual devaluation policy (to encourage resource allocations from the non-traded to the traded sector) complemented with other macroeconomic policy such as industrialization, export promotion etc to alleviate structural problems in LDCs in the long run [for a more comprehensive discussion, see Bird (1981, 1983), particularly Bird (1985) in "Balance of Payments Policy in Developing Countries"].

Criticism

Firstly, it is assumed that a change in fiscal policy keeps the interest rate unchanged. A rise in government expenditure usually increase the demand for money for transactions. In

order to keep the interest rate from rising, the Authorities would have to expand the money supply to meet the increases in transactions. Hence the interest rate is held constant but not the money supply or monetary policy. This assumption is not realistic in the real life. Secondly, there is an inconsistency between the LM and BP curve since the LM curve is based on the stock of money and the BP curve is based on the flow of money. Thirdly, short-term international capital flows may not respond as expected to interest rate differential and their response may not be adequate for correcting the balance of payments problems. Fourthly, the Authorities do not know exactly the effects of fiscal and monetary policies. Fifthly, domestic price level may not remain constant until the full employment level is reached as indicated by the Phillip curve, an inverse relationship between the rate of unemployment and the rate of inflation. Sixthly, there are various lags such as recognition lag, implementation lag before the policies begin to work as the IS-LM-BP model is a comparative static model which totally neglects the significance of time lag and dynamic adjustment process. Seventhly, the approach totally neglects the possible effect of "rational expectation formation" in the economy which do exist clearly in reality.

APPENDIX 3A

Derivation of the Marshall-Lerner conditions starts with Trade Balance equation as

$$TB = P_{wx} X - P_{wm} M \quad 1$$

Total differentiating and substituting 1, it yields

$$dTB = X dP_{wx} + P_{wx} dX - M dP_{wm} - P_{wm} dM \quad 2$$

$$dTB = X P_{wx} P'_{wx} + P_{wx} j_X X P'_{wx} - M P_{wm} P'_{wm} + P_{wx} h_m M P'_{wx} \quad 3$$

Since the identity equations are $P'_x = \xi' + P'_{wx}$ and $P'_m = \xi' + P'_{wm}$, and the definitional equations are $\varphi_x = X/P'_x$, $\varphi_m = M/P'_m$, $\eta_m = M/P'_{wm}$, and $\eta_x = X/P'_{wx}$, it yields four following equations as follows

$$P'_{wx} = -\xi' [\varphi_x (\varphi_x + \eta_x)^{-1}] \quad 4$$

$$P'_x = \xi' [\eta_x (\varphi_x + \eta_x)^{-1}] \quad 5$$

$$P'_{wm} = -\xi' [\eta_m (\varphi_m + \eta_m)^{-1}] \quad 6$$

$$P'_m = \xi' [\varphi_m (\varphi_m + \eta_m)^{-1}] \quad 7$$

Substituting 4 to 7 into 3, it yields

$$dTB = \{\xi X P_{wx} (-\varphi_x + \varphi_x \eta_x)\} \{\varphi_x + \eta_x\}^{-1} + \{\xi M P_{wm} (-\eta_m + \eta_m \varphi_m)\} \{\varphi_m + \eta_m\}^{-1} \quad 8$$

$$dTB = \{\xi X P_{wx} \varphi_x (\eta_x - 1)\} \{\varphi_x + \eta_x\}^{-1} + \{\xi M P_{wm} \eta_m (\varphi_m + 1)\} \{\varphi_m + \eta_m\}^{-1} \quad 9$$

Since the trade balance is firstly balance, $X P_{wx} = M P_{wm}$, then

1st scenario, the ML condition for $\xi > 0$ in order $dTB > 0$ is as follows

$$\{\varphi_x (\eta_x - 1) (\varphi_x + \eta_x)^{-1}\} + \{\eta_m (1 + \varphi_m) (\varphi_m + \eta_m)^{-1}\} > 0 \quad 10$$

2nd scenario of the ML condition when $\varphi_x = \varphi_m = \infty$ (a nation whose supply of exports and the supply of imports are infinitely inelastic) algebraically as follows

$$\lim_{\varphi_x, \varphi_m \rightarrow \infty} [\{\varphi_x (\eta_x - 1) (\varphi_x + \eta_x)^{-1}\} + \{\eta_m (1 + \varphi_m) (\varphi_m + \eta_m)^{-1}\}] = \eta_x + \eta_m - 1 > 0 \quad 11$$

$\varphi_x, \varphi_m \rightarrow \infty$

The above condition 11 is the general case of ML necessary condition.

3rd scenario of the ML sufficient condition when $\eta_x = \varphi_m = \infty$ (a nation with infinitely elastic world demand for exports as well as supply of imports), then by taking the limit of equation 10

$$\lim_{\eta_m, \varphi_m \rightarrow \infty} [\{\varphi_x (\eta_x - 1) (\varphi_x + \eta_x)^{-1}\} + \{\eta_m (1 + \varphi_m) (\varphi_m + \eta_m)^{-1}\}] = \varphi_x + \eta_m > 0 \quad 12$$

$\eta_m, \varphi_m \rightarrow \infty$

CHAPTER 4

REVIEW OF EMPIRICAL LITERATURE

4.1. Studies on the Elasticities Approach to the Balance of Payments (EABP)¹

This section presents a brief survey of empirical studies on the Elasticities Approach to the Balance of Payments (EABP). It is not intended to provide a comprehensive survey of all the empirical issues associated with the existing empirical studies on the subject². It is proposed rather to provide only a reference point against which to refer the results of the present study (see also chapter 3.1 and 6.1).

This section is organized into two parts. Part 4.1.1 discusses empirical models and results of the EABP hypothesis, and part 4.1.2 presents methodological issues and conclusions. A detailed explanation of notations is presented in chapter 5.

¹Review of empirical literature on the Absorption Approach to the Balance of Payments (AABP) will not be discussed because previous studies on the subject did not use the standard Absorption model employed in this study (chapter 3.2 and 6.2). Researchers have tended to use econometric models in an *ad hoc* manner instead (Miles 1979, and Kenen-Pack 1980).

²A comprehensive survey of the theoretical and empirical works on the Elasticities Approach is provided by Sohmen (1969), Stern-Francis-Schumacher (1976) and notably Goldstein-Khan (1985).

4.1.1. Empirical Models and Results of the EABP hypothesis

In relation to data used, the Elasticities models can be classified into two classes, first, those models which use cross section data and analyze trade flows between countries (for example Shinkai 1962), second, those models which utilize time series data and analyze individual flows of a country. This study emphasizes the second one since time series data is employed to estimate the Elasticities models for the Indonesian economy (chapter 6 and 7).

The Marshall-Lerner condition is ³

$$\frac{dTB}{d\xi} = -X \frac{\varphi_X (1+\eta_X)}{\varphi_X - \eta_X} + M \frac{\eta_m (1+\varphi_m)}{\varphi_m - \eta_m} \quad 4.1.1.1$$

where dTB stand for the change in the nation's trade balance measured in domestic currency, $d\xi$ for the change in the exchange rate, X for exports, M for imports, φ_X for the elasticity of export supply, η_X for the elasticity of export demand, η_m for the elasticity of import demand and φ_m for the elasticity of import supply.

If the supply elasticities are approaching infinity (a small-country case) and the trade balance is initially in balance, then the necessary condition for devaluation to improve the trade balance is if the total of the price elasticities of demand for exports and imports exceeds one algebraically as

$$\frac{dTB}{d\xi} > 0 \quad \text{if} \quad \eta_X + \eta_m > 1 \quad 4.1.1.2$$

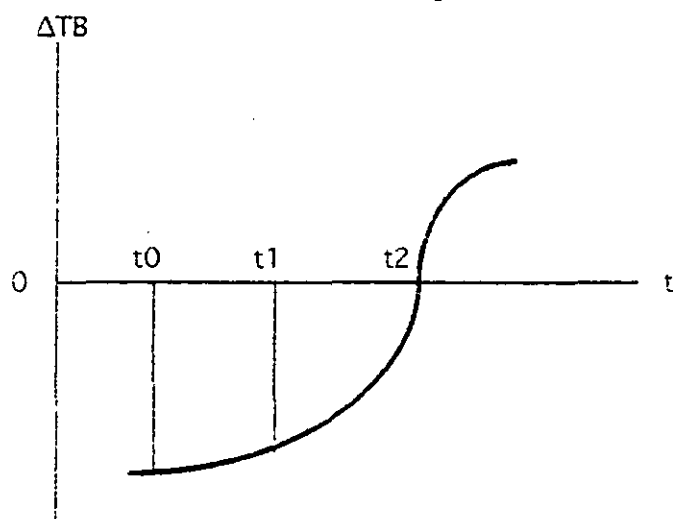
³This equation is formally derived from Alexander (1959) with slightly different notation (see chapter 3 for the mathematical derivation).

Equation 4.1.1.2 is the general case of the well-known Marshall-Lerner criterion which is applied mostly to industrialized countries. The sufficient condition for devaluation to improve the trade balance is if the sum of the price elasticities of demand for imports and of supply of exports greater than zero algebraically as

$$\frac{dTB}{d\xi} > 0 \quad \text{if} \quad \varphi_x + \eta_m > 0 \quad 4.1.1.3$$

The EABP views devaluation as the potent mechanism of adjustment; it suggests the computation of the above price elasticities as the analytical tool by which macro policies can be adopted to achieve the balance of payments target. if the above conditions are satisfied, the devaluation will be succesful. However, according to the "J-Curve Effect" hypothesis, the short-run effect of a devaluation may worsen the trade balance, before improving it after a lag period (see graph 4.1.1.1).

Graph 4.1.1.1
J-Curve Shape



In order to estimate the criterion, price elasticities of imports and exports have to be derived from export and import functions as follows. On the import side, imports (M) depend upon the level of real economic activity (Y_r) and the relative price of imports (P_{rm}), algebraically as follows

$$M = \omega_1 (Y_r)^{\omega_2} (P_{rm})^{\omega_3} \quad 4.1.1.4$$

4.1.1.4 can be rewritten in the logarithmic form ⁴ as follows

$$\ln M = \text{constant} + \omega_2 \ln Y_r + \omega_3 \ln P_{rm} + v_1 \quad 4.1.1.5$$

where constant = $\log \omega_1$ and v_1 is the disturbance terms.

On the export side, exports (X) depend upon the level of real world economic activity (Y_r^*) and the relative price of exports (P_{rx}) algebraically as

$$X = \omega_4 (Y_r)^{\omega_5} (P_{rx})^{\omega_6} \quad 4.1.1.6$$

4.1.1.6 can be rewritten in the logarithmic form as follows

$$\ln X = \text{constant} + \omega_5 \ln Y_r^* + \omega_6 \ln P_{rx} + v_2 \quad 4.1.1.7$$

where constant = $\log \omega_4$ and v_2 is the disturbance term.

From the estimation of equation 4.1.1.5 and 4.1.1.7 ⁵, the Marshall-Lerner condition for the effect of a devaluation on the trade balance can be deducted. If the sum of the price elasticity of demand for foreign imports and the price elasticity of demand for domestic export is greater than unity, devaluation will improve the trade balance.

⁴Where the disturbance term of 4.1.1.4 is assumed to be multiplicative.

⁵Although there are several possible functional forms of the model (chapter 6.1), the advantage of 4.1.1.5 and 4.1.1.7 is that it gives a direct measure of the elasticity coefficients.

The above equations can be estimated by assuming that imports and domestic goods can be substituted for each others, the so called "perfect-substitutes" model. Another method is to differentiate between goods which are perfect substitutes and those which are not perfect substitutes by deriving individual functions for specific goods; the "imperfect-substitutes" model (see Clark 1977, Goldstein-Khan 1985). In early studies during 1930s and 1940s, it was expected that the price elasticities in the world trade were small. For example early studies by Chiang (1945, 1948) indicated that the sum of the demand elasticities hardly exceeded unity ⁶. This led to the so-called "elasticity pessimism". However, Harberger (1950) and Orcutt (1950) have showed that the earlier studies had some theoretical flaws, i.e. the statistical techniques used to estimate the price elasticities led to underestimation of the "true" elasticities, particularly because of the problem of identifying shifts in demand. Researchers in the 1930s and 1940s tended to estimate short-run rather than long-run; they ignored the fact that the price elasticities are greater in the long run. For example Junz-Rhomberg (1973) showed that the trade balance responses to devaluation requires four to five years. They indicated that less than 50 per cent of the full effect arises during the first three years following the devaluation whilst another two years must pass before the next 40 per cent of the full effect can come; there has been such long lags in the response of trade volumes to changes in relative price. Junz and Rhomberg further classified 5 major lags in the demand response to devaluation, i.e, the recognition lag, the decision lag, the delivery lag, the replacement lag, and the production lag.

Studies of price elasticities based on trade of the 1950s and 1960s attempted to surmount the methodological problems

⁶The policy implication of these low elasticities is that devaluation can hardly work. Hence more direct means of policy, such as trade controls, have to be employed.

raised by Orcutt (1950). They tended to produce higher elasticity estimates than those earlier studies (Harberger 1957, Houthakker-Magee 1969). This led to the so-called "elasticity optimism". It might be that the "real" elasticities are high enough for exchange rate changes to tend to restore equilibrium (see table 4.1.1.1 and 4.1.1.2). However, there is no firm conclusion to draw for this voluminous empirical literature. These studies were not able to settle the controversy between "elasticity pessimism" and "elasticity optimism" ⁷. (Stern et al. 1976, Salvatore 1983). Most recent studies in the 1980's show that these elasticities have declined due to the great variability of exchange rates; this variability has weakened business confidence that spot exchange rate is a "best" guide to future exchange rates (Williamson-Milner 1991).

Table 4.1.1.1 ⁸
Price Elasticities ⁹ of Demand for Exports

	Stern, Francis, Scumacher (1976)	Houthakker & Magee (1969)	Goldstein & Khan (1976)	Hickman & Lau (1973)
United States	-1.41	-1.51	-2.32	-1.07
Germany	-1.11	-1.25	-0.83	-0.76
Japan	-1.11	-0.80	2.47	-0.46
France	-1.31	-2.27	-1.33	-0.96
Italy	-0.93	-1.12	-3.29	-0.71
United Kingdom	-0.48	-1.24	-1.32	-1.05

⁷Some economists argue that the controversy was due to the fact that the elasticities were analyzed in partial equilibrium and single equation context, ignoring the interrelationships among economic variables such as by general equilibrium and simultaneous context (Gandolfo 1986).'

⁸The word "ns" means that the parameter coefficient is not significant while "--" means the coefficient is not available.

⁹The higher the price elasticity, the greater the effects on the quantity of exports and imports in response to price changes due to devaluation. A unitary price elasticity means that the quantity exports or imports will not change due to price changes; the quantity changes will cancel out exactly for any price changes that may occur.

Canada	-0.79	-0.59	---	-0.56
Belgium	-1.02	ns	-1.57	-0.67
Netherlands	-0.95	-0.82	-2.73	-0.72
Austria	-0.93	-1.30	---	-0.76

Tables 4.1.1.1 and 4.1.1.2 reveal that the Marshall-Lerner condition is satisfied for industrialized countries in the 1970s, that is, the sum of the price elasticities of demand for imports and exports is higher than unity. It suggests that relative prices do play a vital role in the adjustment mechanism in industrial countries; expenditure switching policy exercises a strong influence on the balance of payments. Surprisingly the results are in line with Khan (1974) that the Marshall-Lerner criterion for efficacious devaluation would be easily fulfilled in developing countries ¹⁰. Following exchange-rate change, however, the trade balance worsens for some times before it finally improves; in the international trade literature this phenomenon is known as the "J-Curve Effect" hypothesis. The causes of the "J-Curve" is low short-run elasticities ¹¹. Empirical studies indicates that long-run elasticities are approximately twice as high as the short-run ones and around 50 per cent of the price adjustment takes time within a year (Goldstein-Khan 1985). Previous studies also reveal that the time lag entailed in the trade balance improvement of devaluation varies considerably from country to country (Goldstein-Khan 1976).

¹⁰The countries under study were Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Ghana, India, Morocco, Pakistan, Peru, Philippines, Sri Lanka, Turkey and Uruguay.

¹¹ The short-run elasticities are lower than the long-run ones because rigidity of contracts signed before devaluation, consumers react slowly to price changes because it needs time to adjust, and traders are likely to wait until they convince that the benefits will last long.

Elasticities are conventionally defined *ceteris paribus* other factors are assumed to be constant, although in real life they will certainly change. Recent studies on the elasticities (Houthakker-Magee 1969, Gregory 1971) tended to produce higher results of price elasticities than those in the earlier studies, after taking into account other these other factors (*ceteris paribus* assumption) which frequently shifts the demand and supply curve.

Table 4.1.1.2
Price Elasticities of Demand for Imports

	Stern, Francis, Scumacher (1976)	Houthakker & Magee (1969)	Goldstein & Khan (1976)	Ross & Khan (1975)
United States	-1.66	-1.03	-0.45	-1.00
Germany	-0.88	ns	-0.70	-0.53
Japan	-0.78	-0.72	-0.01	0.15
France	-1.08	ns	-1.09	-0.30
Italy	-1.03	ns	-0.16	-1.67
United Kingdom	-0.65	ns	0.17	-0.39
Canada	-1.30	-1.46	—	-2.13
Belgium	-0.83	-1.02	-0.62	-0.22
Netherlands	-0.68	ns	0.33	0.37
Austria	-1.32	—	—	-0.59

In estimating the above price elasticities of imports and exports, it is assumed by the researchers that domestic price levels were constant (no "pass-through" effect). To examine the robustness of the price elasticities of exports and imports, a "pass-through" effect of devaluation has to be examined. The existence of "pass-through" effects is supported recently by Basmani-Oskooee-Malixi (1992). They show that devaluations are contributing factors to inflation in LDCs. The positive and highly significant effect of devaluation on the inflation rate supports the "pass-through" hypothesis as an indication of the existence of nominal wage and price stickiness (see chapter

6.1). This increase in the domestic price would significantly affect the relative price of imports and exports thereby having strong implications for the interpretation of the price elasticities figure estimated previously. In consequence, this will lessen or diminish estimated price elasticities of imports and exports; the "true" price elasticities figures would be larger than those presented. Intuitively, the Marshall-Lerner condition for devaluation to improve the trade balance is more difficult to achieve. Besides those inflationary effects, for most LDCs it is indicated that devaluation is also contractionary. For example, econometric studies (Morley 1992, Gylfason-Radetzki 1991) about the effects of devaluation in LDCs indicate that real devaluation tends to reduce real output as an indication of the contractionary effects. If there is a rigid real wage, import consists of both intermediate inputs and final goods in the economy, and trade balance is initially deficit, this would increase the likelihood of economic contraction following devaluation (see for example Buffie 1989). In fact Hojman (1989) in "Fundamental Equilibrium Exchange Rates Under Contractionary Devaluation: A Peruvian Model" shows that in both the short-run and the long-run, devaluation did have a contractionary effect on domestic economic activity.

Miles (1979) examined the experience of 14 countries during the 1956-1972 devaluations. Examining the nation's balance of payments and balance of trade and "controlling" the nation's fiscal and monetary policies, he concluded that on the average the trade balance was adequate until the actual year of devaluation. However, the year succeeding devaluation the trade balance bounced back sharply from its poor state in the year when the devaluation occurred but the improvement only lasted for a single year. There was no long-sustained improvements in trade balance or the overall balance of payments after devaluation. Thus, a reverse "J-Curve" effect was suggested here. Cooper (1971) examined the experience of 24 developing

countries during 1959-1966 devaluations. By examining the changes in trade flows before and after devaluations, he concluded that the trade balance improved following devaluations in 15 out of 24 cases. The "J-Curve" effect was suggested in this case. The improvements came from increases in exports and decreases in imports. Interestingly, his study showed that there were indications of contractionary pressures following devaluation in which nominal prices and wages tended to increase. This existence of "pass-through" effects was also supported by Donovan (1981) and Bautista's (1982) studies that devaluation in less developed countries increases domestic prices. It is difficult to sustain domestic price changes due to devaluation. Hence inflationary effects counteract the price advantages that the devaluation is designed to give domestic product in the foreign and domestic market. Kamin (1988) and Bhagwat-Onitsuka (1974) also produced results consistent with the "J-Curve" effect that exchange-rate changes tend to improve trade balance in the long-run. Bhagwat-Onitsuka further indicated that long-term improvement in the balance of trade was caused by significant export responses but insignificant import responses, however, the export responses depend mainly upon the level of country's development and the country's structure of trade. The responses of non-traditional exports are stronger than those of a more traditional nature. Moreover a traditional export supply response to devaluation is more responsive in weather rather than in the movement in the market demand. Bhagwat-Onitsuka (1974) and Donovan (1981) further show that the increase in imports was on average higher than the increase in exports. However, Kamin (1988) shows that it is unclear whether any improvement following devaluation is merely cyclical or resulting from the devaluation itself since macroeconomic performance deteriorated prior to the devaluations, improving following devaluations and declining again. In addition the trade-balance improvement is caused by an increase in exports rather than a decrease in imports. Kamin's results support

earlier findings about the "J-Curve" effect and he do not find any evidence that devaluation is contractionary but found devaluation was associated with increases in inflation (a significant "pass-through" effect). From a policy perspective, Edwards (1989) uses non-parametric test in comparing the behaviour of the devaluing countries and those of a control group of 24 LDCs that maintained a fixed exchange rate. He further indicates that the immediate cause of devaluation has been a rapid depletion of the stock of foreign exchange reserves due to expansive domestic credit policies by the Authorities.

4.1.2. Empirical Issues and Conclusions ¹²

A vital purpose of the previous studies is to give empirical estimates of the price and income elasticities which will be useful for a country's trade policy, however, there have been several methodological problems associated with estimation procedures in the context of import and export functions. This section does not cover all methodological and econometric issues, however, it attempts to examine the major ones.

Aggregation Problem

Many of the empirical works use broad commodity groups rather than narrowly defined commodity groups. Particularly the empirical studies in developing countries mostly used aggregated data since the less disaggregated data is not yet available (Khan 1974). The best available data on imports and exports is stated in value rather than volume. The value data

¹²This section draws heavily from Orcutt (1950) and Leamer-Stern (1970).

then has to be deflated by price of imports or exports to obtain volume as the proper dependent variable according to the theory of demand as

$$M = \frac{V_m}{P_m} \quad 4.1.2.1$$

$$X = \frac{V_x}{P_x} \quad 4.1.2.2$$

The relationship in 4.1.2.1. and 4.1.2.2 may be rewritten in the context of an aggregation index as follows

$$M = \frac{V_m}{P_m} = \frac{\sum_i P_{m_i} Q_{m_i}}{\sum_i [P_{m_{i0}} Q_{m_i} (\sum_i P_{m_{i0}} Q_{m_i})^{-1}] [P_{m_i} (P_{m_{i0}})^{-1}]} \quad 4.1.2.3$$

$$X = \frac{V_x}{P_x} = \frac{\sum_i P_{x_i} Q_{x_i}}{\sum_i [P_{x_{i0}} Q_{x_i} (\sum_i P_{x_{i0}} Q_{x_i})^{-1}] [P_{x_i} (P_{x_{i0}})^{-1}]} \quad 4.1.2.4$$

where M stands for volume of imports, X for volume of exports, V_m for value of imports, V_x for value of exports, P_m for "aggregate" import price, P_i for import price of good i in the period t, P_{i0} for import price of good i in the base period, Q_m for "aggregate" import volume, Q_i for import volume of good i in the period t, Q_{i0} for import volume of good i in the base period, P_x and Q_x are interpreted analogously for exports. If goods are homogeneous, M and X will be proper measures of volume. However, if goods of diverse elasticity are put in the estimation, the "aggregate" elasticity tends to be biased towards zero since the greatest price fluctuations are likely to be observed in the goods which are inelastic, or to say that the use of aggregated data may give excessive weight to goods with low elasticities (Heller 1973). Accordingly M and X will not have an accurate relationship to "true" volume.

Lag Adjustment

Adjustment to price and income changes is not instantaneous; it may take some times before economic units have completely adjusted. The knowledge of the true lag is vital for evaluating macropolicy issues such as the short-run and long-run impact of changes in tariffs, in exchange rates etc. Up to now there is no consensus about the proper specification of the distributed-lag pattern of the Elasticities model whether it follows Koyck, Almon, Adaptive Expectation or Polynomial lag pattern. Current views tend to favour, however, the Almon lag (Junz-Rhomberg 1973).

Time period

The estimates of price and income elasticities depend mainly upon the time horizon under study since the marginal propensity to import (MPM) and to export (MPX) changes over time. In addition, according to the theory of demand, in the short run the demand for imports and exports are highly inelastic since consumers do not have time to adjust their consumption pattern. In the longer run, consumers can adjust fully to the changes in prices, so demand for imports and exports tend to be more elastic. In general the studies indicate that the longer the time period, the larger the demand elasticities for imports and exports. On the contrary, only one study reveals that the Marshall-Lerner criterion is satisfied in the short-run but not in the long run, hence devaluation will improve the balance of payments in the short run only while in the long run its effect will be adverse (Turnovsky 1968).

Identification Problem

It happens because most researchers' assume that the response of volume to price was a demand response only. In reality, price and volume always refer to the intersection of supply and demand functions. Since most researchers tried to estimate only a demand function, this would cause an identification problem (simultaneous bias). However, this problem has been shown to be soluble. It is argued (Klein 1960, Goldstein-Khan 1985) that, first, for developing countries the supply side ¹³ can be treated as being perfectly elastic with respect to price then the simultaneity problem therefore vanishes, and that, second, disaggregation of imports by product category, food, raw materials, semi finished helps to reduce the problem of bias.

Errors in Measurement Problem

The data may reflect errors of measurement of volume, price and other variables. Accordingly, there is an errors in measurement problem because one of the standard assumptions of the standard regression model is violated. This may result in biased parameter estimates as illustrated below. If the "true" demand curve for import is

$$Q^m = \theta_1 + \theta_2 P^m + v_1 \quad 4.1.2.5$$

where v_1 is random error. Since researchers did not observe P^m but observe Ω where

$$\Omega = P^m + v_2 \quad 4.1.1.6$$

¹³Perfectly elastic price of export supply implies that domestic price constant no matter how much is exported.

A regression of Q^m on Ω leads to further biased parameter estimate because of the correlation of Ω and the disturbance term of $(v_1 - \theta_2 v_2)$ as follows

$$Q^m = \theta_1 + \theta_2 (\Omega - v_2) + v_1 \quad 4.1.1.7$$

$$Q^m = \theta_1 + \theta_2 \Omega + (v_1 - \theta_2 v_2) \quad 4.1.1.8$$

Other problems related to the use of dummy variables to "remove" unusual disturbances of the data. This might have disadvantage of imposing regularities on the data, that might be unsuitable for the particular demand curve being examined (Leamer-Stern 1970).

From the survey on existing studies, several important findings and features of empirical evidence are summarized as follows :

- In earlier studies, estimates of price elasticities gave support to the "pessimistic" side. However, the strength of pessimism has been reduced by critical evaluations of the results. More recent studies seem to produce higher elasticities, substantially higher than unity. The change toward "optimism" is based mainly on researchers' appreciation of the possible statistical biases involved and appreciation of the possible "pass-through" effects (the transmission of the exchange-rate onto domestic price level). Most empirical studies indicate that the transmission coefficient is significant; devaluation induced higher domestic price thereby accelerating inflation. Hence the benefit of the price effects on the imports and exports induced by the devaluation would be negated by inflationary effects of the devaluation or to say that the real devaluation was less than nominal devaluation. One of the reasons is that devaluation might lead to higher wages; a cost-push spiral, a "ratchet effect", in which prices are revised upwards following devaluation but not adjusted downwards.

•In some studies, price and income elasticity are higher in the long-run than in the short-run. In the short term, import and export elasticity estimates are lower than those in the long run because of the "switching lag". The trade balance may respond perversely in the short-run movements but long-run elasticities are considerably larger as predicted by the "J-Curve Effect" hypothesis. Price elasticities in the international trade are in general high enough to allow long-run correction of the trade balance by devaluation. However since some studies support the evidence of the "J-Curve Effect" hypothesis, but some do not (a reverse "J-curve" effect), the evidence of the "J-Curve Effect" to date is still inconclusive.

•The studies indicate that researchers employ a range of specification methods, data sets, estimation procedures and time periods in examining the EABP hypotheses. Despite Orcutt's (1950) criticism 40 years ago, nowadays most researchers still employ a single-equation method regressing imports or exports on price and income. Recent and alternative methodologies to test the efficacy of devaluation used by researchers (see also chapter 3) are *inter alia* to regress exchange-rate changes on macroeconomic indicators, and to examine key indicators of economic performances moved before, during and after devaluations.

•Most studies show that changes in the exchange rate are contributing factors to changes in domestic price level thereby increasing the rate of inflation; the transmission of exchange rate variables onto domestic price is significant in most cases. Devaluation is shown to induce higher domestic price. The phenomena might be due to the fact that the publicity of devaluations caused a greater price responsiveness, domestic producers may take the opportunity of raising the price of all goods not just those that are affected by devaluation and excessive domestic credit policy may aggravate domestic prices. Accordingly inflationary effects counteract the price

advantages that the devaluation is designed to give domestic product in the world market.

- There appears to be some disagreement concerning appropriate functional relationships of the models, for example between linear, lin-log, or log-log function; this often being decided in an *ad hoc* manner. The controversy over single-equation versus simultaneous-equation methods, and over the definition of the variable ¹⁴ for instance real income versus real expenditure (see Aghevli Khan 1980, Brillemborg 1975), secular versus cyclical real income (for example Johnson 1958, Magee 1975) remain. The primary progress of the empirical studies has been to employ better data sets and more observations, to improve the specification, to use more appropriate econometric tests and to use the different methodologies.

- There are mixed results concerning the contractionary effects of devaluation. Some studies indicate that in the short-run and the long-run devaluations did have a contractionary effect on

¹⁴Leamer-Stern (1970) for example provides several explanatory variables for estimating Import Demand function as follows

Total Imports	Imports of Finished Goods	Imports of Unfinished Goods
Real GNP; degree of capacity utilization	Real disposable income; real expenditure components; degree of capacity utilization	Industrial production; real change in inventories; degree of capacity utilization
Relative price of imports	Relative price of imports	Relative price of imports
Dummy variables for unusual periods	Dummy variables for unusual periods	Dummy variables for unusual periods
Dummy variables for seasonal variation	Dummy variables for seasonal variation	Dummy variables for seasonal variation
Lagged Variables	Lagged Variables	Lagged Variables
Foreign Exchange Reserves	Foreign Exchange Reserves	Foreign Exchange Reserves
Credit	Credit	Credit

domestic economic activity whilst other studies show no evidence of a contraction following devaluation. There are also mixed results concerning the evidence that devaluation improved trade balance. Some studies show that trade balance improved due to devaluation but some studies also revealed that the improvement of the trade balance only lasted for a short period, no long-sustained improvements after devaluation were observed.

4.2. Studies on the Monetary Approach (MABP) and the Capital Market Approach to the Balance of Payments (CMABP)

This section presents a critical review of empirical findings on the Monetary Approach to the Balance of Payments (MABP) and the Capital Market Approach to the Balance of Payments (CMABP). It is organized into four sections. Section 4.2.1 discusses empirical models of the MABP and the CMABP hypotheses. Section 4.2.2 talks about empirical results. Section 4.2.3 presents methodological issues. Section 4.2.4 discusses econometric issues. Finally section 4.2.5 presents the summary and conclusions. A detailed explanation of notation is presented in chapter 5, whereas the tables of empirical results are given in appendixes 4A and 4B.

4.2.1. Empirical Models of the MABP and the CMABP hypotheses

Any economic theory can be appraised either by reviewing the validity of its assumptions or by examining its explanatory power. This chapter emphasizes the latter by testing the MABP and the CMABP hypotheses empirically. However it does not examine the hypotheses theoretically nor review the validity of their assumptions; this subject can be found in Friedman (1953) and Johnson (1972).

This section aims to highlight methodological, measurement, and econometric issues relating to estimation procedures. The empirical literature on the MABP and the CMABP propositions are now so voluminous that this chapter does not pretend to offer a comprehensive literature survey ¹⁵. In spite of that, it

¹⁵Different versions in testing the MABP hypothesis, for example by Polak (1957), Polak-Argy (1971), and Blejer (1977) will not be discussed.

concentrates on the studies of several developing countries though some relevant studies for industrial countries are also considered in the context of the Reserve Model ¹⁶ (RM), the Capital Model (CM) for both single and simultaneous equations.

The Reserve Model (RM)

A major argument of the MABP hypothesis is that under a fixed-exchange-rate system changes in a nation's reserves are a result of excess demand for or supply of money. This premise will be examined in the context of the Reserve Model originally developed by Mundell (1968) and Johnson (1972). The testable equation for the MABP theory, known as the prototype Reserve Model (RM) ¹⁷, is written as follows

$$RH^{-1} \Delta \log R = \omega_0 + \omega_1 \Delta \log Y^r + \omega_2 \Delta \log P + \omega_3 \Delta \log \Pi + \omega_4 \Delta \log i + \omega_5 \Delta \log \lambda + \omega_6 DH^{-1} \Delta \log D + v_1 \quad 4.2.1.1$$

where R stands for foreign exchange reserves, H for monetary base, Y^r for domestic real income, P for domestic price level, Π for domestic inflation rate, i for domestic interest rate, λ for money multiplier, D for domestic assets or domestic component of the monetary base, ω_i for regression coefficients where $i = 1$ to 6, Δ for first-difference operator, and v_1 for stochastic disturbance terms. The expected parameter values are as follows, $\omega_1 > 0$, $\omega_2 - 1 = 0$, $\omega_3 < 0$, $\omega_4 < 0$, and $\omega_5 = \omega_6 = -1$, and the expected magnitude of the values are $\omega_1 = 1$, $\omega_4 = -0.01$ (Laidler 1985). A rise in the domestic income increases the demand for

¹⁶In this study, the Elasticities Model (EM) is the empirical model of the EABP hypothesis, the Absorption Model (AM) is of the AABP, the Reserve Model (RM) is of the MABP, and the Capital Model is of the CMABP.

¹⁷The mathematical treatment in building the Reserve and Capital models is elaborated in chapter 3.3 and 3.4 on the Review of Theoretical Literature (see also chapter 6.3 and 6.4).

real balance, this in turn leads to a surplus in the balance of payments, while an increase in the domestic interest rate and inflation (as the opportunity costs of holding money) decreases the demand for real balances, it consequently causes a deterioration to the balance of payments as international reserves are depleted.

The Capital Model (CM)

The Capital market model or Capital Model for short was developed by Kouri-Porter (1974). Unlike the MABP, the CMABP argues that exogenous changes in the supply of and demand for money have no influence on the current account and the net inflow of official capital other than foreign reserves. The surplus or deficit is limited only to private capital flows. In consequence the private capital inflows (K) replace the changes in foreign reserves (ΔR) as the dependent variable in the Reserve Model of 4.2.1.1. Thus the testable equation for the CMABP or the standard Capital Model ¹⁸ (CM) is given as follows

$$K = \pi_0 + \tau_1 \Delta i^* + \tau_2 \Delta i + \tau_3 Y^n + \tau_4 \Delta D + \tau_5 CB + v_2 \quad 4.2.1.2$$

where K stands for private capital inflow, i^* for foreign interest rate, Y^n for domestic nominal income, D for domestic assets, CB for current balance plus official capital inflow, τ_i for regression coefficients where $i = 1$ to 5, Δ for first-difference operator, and v_2 for stochastic disturbance terms. The expected signs for perfect capital mobility are as follows, $\tau_1 < 0$, $\tau_3 > 0$, $\tau_4 = -1$, $\tau_5 = -1$, and $\tau_2 > 0$. A rise in domestic income will *ceteris paribus* reduce the total demand for bonds since it

¹⁸In some studies, the inclusion of domestic and world interest rates and domestic and world interest rates differential are decided in *ad hoc* manner (Krein-Officer 1978).

increases the demand for money. This in turn is partially satisfied by capital inflows, hence a positive relationship between domestic income and capital inflows. An increase in the domestic interest rate attracts foreign investors, this in turn leads to capital inflows. While an increase in the world interest rate leads to capital outflows since domestic residents invest money in the world markets.

The Simultaneous Model (SM)

The above Reserve (RM) and the Capital (CM) models are estimated by using single estimation methods; it is assumed that the right hand side (explanatory) variables of the models are exogenous and determined independently with the growth in the flows of reserve (unidirectional causation running from domestic money to the flows of reserve), and with the growth in the private capital inflows (unidirectional causation running from domestic money to the flows of capital). However if domestic money is partly determined by the flows of reserve or by the flows of capital, then single equation estimates of the Reserve and Capital models will be biased. The bias comes from the violation of the assumption of the Ordinary Least Squares (OLSQ) method. It arises from the dependence of the explanatory variables on v [$\{E(v, X_i) \neq 0\}$ where X_i is a set of the independent variables of the Reserve and the Capital models, E is expectation operator, and v is random error term]. To overcome the bias, equation 4.2.1.1 and 4.2.1.2 must be estimated simultaneously with an equation specifying the reaction function by simultaneous equation methods. Subsequently in this study, the Reserve or Capital model which is estimated by simultaneous estimation procedures is called the Simultaneous Model (SM).

4.2.2. Empirical Results ¹⁹ of the MABP and the CMABP hypotheses

The collection of empirical tests of the MABP and the CMABP hypotheses can be found in

- the application of the Reserve Model (RM) to Australia by Zecher (1976), to Japan by Bean (1976), to Spain by Guitian (1976), to less developed countries by Connolly-Taylor (1976), Aghevli-Khan (1977), and by Bhatia (1982),
- the application of the Capital Model (CM) to Italy, Germany, Netherlands, Australia by Kouri-Porter (1974), and to Austria, France by Hodjera (1976) and
- the application of the Simultaneous Model (SM) to Sweden by Genberg (1976), and to LDCs by Uddin (1985).

A variety of researchers investigate the Reserve and the Capital models of 4.2.1.1 and 4.2.1.2 by using Ordinary Least Squares (OLSQ) techniques. However, the researchers' specifications of the model vary individually to some extent from the standard model of 4.2.1.1 and 4.2.1.2. For example, Zecher (1976) employs $R/H \Delta \log R$ as the dependent variable, Bean (1976) uses $R/R+D \Delta \log R$, while Aghevli-Khan (1977) utilizes $R_t/H_t \Delta R_t/R_{t-1}$. Some other researchers such as Genberg (1976) & Uddin (1985) utilizes the Simultaneous Model (SM) of the Two Stage Least Squares (2SLSQ) by combining the Reserve Model (RM) jointly with a sterilization equation. Genberg (1976) for example uses a sterilization equation as follows

$$D/H \Delta \log D = \alpha_0 + \alpha_1 R/H \Delta \log R + \alpha_2 \Delta \log G^d + u_3 \quad 4.2.2.1$$

¹⁹See appendix 4A and 4B. Appendix 4A presents methods, time periods, countries under study, and overall findings. Appendix 4B presents researchers' models to show independent and dependent variables used. Since some researchers employ more than one regressions in their works, the regressions chosen are the robust ones (which are based on their coefficient determinations, standard errors, and Durbin Watson statistics).

On the other side, Uddin (1985) employs slightly different variables for the reaction function as

$$\begin{aligned} D_t/(D_t+R_t) \Delta D_t/D_{t-1} = & \beta_0 + \beta_1 R_t/(R_t+D_t) \Delta R_t/R_{t-1} \\ & + \beta_2 \Delta G^d_t/G^d_{t-1} + \beta_3 \Delta P_t/P_{t-1} + \beta_4 t + u_4 \end{aligned} \quad 4.2.2.2$$

where G^d stands for government debt, t for time, and the others as explained in chapter 5.

In examining the Capital Model (CM) for Germany, Kouri-Porter (1974) adds some explanatory variables in the right hand side, namely (ΔR) , $(\Delta D - \Delta R)$, and $(CB + K)$. While Hodjera (1976) applies the prototype model of 4.2.1.2 with a slight modification by employing a dummy variable (d) and a one-period lag ($t-1$) to examine the possibility of a lag adjustment of capital flows to the independent variables of the Capital Model (CM) as follows

$$\begin{aligned} K_t = & \tau_0 + \tau_1 \Delta i^*_t + \tau_2 \Delta i_t + \tau_3 Y^n_t + \tau_4 Y^n_{t-1} + \tau_5 \Delta D_t + \tau_6 \Delta D_{t-1} \\ & + \tau_7 CB_t + \tau_8 CB_{t-1} + \tau_9 d + u_5 \end{aligned} \quad 4.2.2.3$$

The Reserve Models (RM) used by researchers (appendix 4B) differ, however, they show the common principle of the MABP hypothesis that the balance of payments is fundamentally a monetary phenomenon. Economic growth and growth in price are expected to correlate positively with the balance of payments via a rise in the demand for real balances, whereas increases in domestic interest rates, money multiplier, and domestic assets lead to a balance of payments deficit (as a reflection of an excess money supply) ²⁰.

²⁰The basic implications of the MABP hypothesis are contradictory to the traditional Keynesian Absorption approaches. The AABP theory, for example, suggests that economic growth necessarily leads to an outflow of reserves, and domestic credit creation will improve the balance of payments by stimulating investments. This increase in investment, in turn, raises economic productivity and lower domestic prices relative to world prices which consequently improves the balance of payments. The MABP theoretical expectation of the domestic interest rate is not also in line with the CMABP hypothesis. The MABP hypothesis expects the

Table 4.2.2.1 ²¹
The Robustness of the Regressors
of the Reserve and the Capital Models

Regressand	Foreign Exchange Reserves (R) or Private Capital Inflow (K)									
	Y	i	i*	D	CB	λ	P	P*	Π	Ξ
Expected Signs	+	-	-	-	-	-	+	+	-	+
Kouri-Porter 1974	+		-	-						
Zecher 1976	+	-		-		-	-			
Bean 1976	+	-		-		-	-			
Genberg 1976	+	-		-		-	-			
Guittan 1976	+						+	+		
Connolly-Taylor 1976				-						+
Hodjera 1976	-		+	-	-					
Aghevli-Khan 1977	+			-		-	+		-	
Bhatia 1982	+	-		-		-	+			
Uddin 1985	+	-		-			-			
The thesis 1992	-	-		-			-			

From examination of the results (table 4.2.2.1 and appendix 4B), a number of vital findings emerge as follows

- Domestic interest rate (i) variable, followed successively by income (Y) and domestic asset variables proves to be statistically significant (robust) in explaining foreign exchange reserves (R) or private capital inflows (K).

domestic interest rate coefficient to be negative (a rise in the domestic interest rate reduces the demand for money as domestic residents substitute from money to bond. This leads to an excess demand for foreign exchange reserves, thus a deficit in the balance of payments). The CMABP hypothesis to be positive (a rise in the domestic interest rate causes capital inflows, thus a balance of payments surplus).

²¹A complete explanation of symbols is presented in chapter 5. CB stands for current balance. D for banks' domestic assets or domestic component of monetary base, Ξ for exchange rate, i for domestic interest rate, i* for world interest rate, P for domestic price level, P* for world price level, R for international reserves, Y for income, λ for money multiplier, and Π for inflation rate ($P_t = \Delta P_t / P_{t-1}$).

- Domestic income (Y) variable achieves statistical significance although in all studies only when these variables are included one at a time. It may be a contest of explanatory variables which the winner depends on the sample period, the definition of data, and econometric detail.
- Price (P) and inflation (Π) variables do not perform well in explaining the dependent variable of the Reserve and the Capital models.
- The evidence on neutralization ²² is ambiguous. It indicates that some countries have been able to sterilize entirely (the sterilization coefficient ²³ significantly equals minus unity), however, some countries have been able to sterilize only partially the effects of the balance of payments on the domestic money supply (the sterilization coefficient is negative but significantly less than unity). On the contrary, some countries have not been able to neutralize those effects at all (the coefficient statistically equals zero) ²⁴.
- The result of each study can be classified as H₀ (positive result, supporting the hypotheses) H₁ (negative results, not supporting the hypotheses) and H₂ (inconclusive, mixed results) ²⁵. According to this classification, there are four

²²The word neutralization or sterilization is used identically; it is defined as the action of the central bank to isolate the domestic money supply from the effects of balance of payments deficits or surpluses.

²³The offset coefficient (causation from changes in domestic credit to foreign exchange reserves) is the domestic-credit coefficient on the equations 4.2.1.1 and 4.2.1.2, whilst the sterilization coefficients (reversed causation) are, first, the external-reserves coefficients of equation 4.2.2.1 and 4.2.2.2, second, the capital-inflow coefficients of the equations 6.4.2.3, 6.4.2.4 and 6.4.2.5.

²⁴Theoretically neutralization cannot be reached in the long run via open market operation since this requires an equal private sector surplus in which the general public was willing to allocate entirely to the required sales of government debt via financial intermediaries; this violates assumptions concerning the portfolio choice of assets.

²⁵The overall findings can be H₀, H₁ and H₂ which are defined as follows
H₀ : the MABP or the CMABP hypothesis is accepted (POSITIVE RESULTS) if all estimated coefficients equal to the hypothesized values as follows

$\omega_1 > 0, \omega_2 - 1 = 0, \omega_3 < 0, \omega_4 < 0, \omega_5 = \omega_6 = -1, \tau_1 < 0, \tau_3 > 0, \tau_4 = -1, \tau_5 = -1, \tau_2, \tau_6 > 0.$

studies yielding positive results (H_0), six studies yielding negative results (H_1), and seven studies yielding mixed results (H_2). Overall the studies therefore are inconclusive about the validity of the MABP and the CMABP hypotheses.

4.2.3. Methodological Issues

The Offset Coefficient and Bias

A crucial element in the MABP and the CMABP hypotheses is the magnitude of the offset coefficient (ω_6 or τ_4) of the Reserve or Capital model which is reproduced as follows

$$RH^{-1} R^{-1} dR/dt = \omega_0 + \omega_1 Y^{r-1} dY^r/dt + \omega_2 P^{-1} dP/dt + \omega_3 P^{-1} dP/dt + \omega_4 i^{-1} di/dt + \omega_5 \lambda^{-1} d\lambda/dt + \omega_6 DH^{-1} dD/dt + u_6 \quad 4.2.3.1$$

$$K = \tau_0 + \tau_1 \Delta i^* + \tau_2 \Delta i + \tau_3 Y^n + \tau_4 \Delta D + \tau_5 CB + \tau_6 d + u_7 \quad 4.2.3.2$$

Examination of the results (appendix 4B) reveals mixed support from the evidence; whether or not the changes in the domestic assets of monetary base (ΔD) will be offset proportionally by changes in reserves (ΔR) or in capital flows (K) is still inconclusive. The results by Conolly-Taylor (1976), Genberg (1976), Guitian (1976), and Zecher (1976) defend the premise that the offset coefficients statistically equal minus one. Nevertheless, the results of other studies (Bean 1976, Kouri-Porter 1974) tend to question the robustness of the sterilization hypothesis since the offset coefficients differ significantly from minus one.

H_1 : the MABP or the CMABP hypothesis is not accepted (NEGATIVE RESULTS), if one of the estimated coefficients do not equal to the hypothesized values.

H_2 : the MABP hypothesis is either accepted or rejected (MIXED RESULTS OR INCONCLUSIVE), if some researchers' regressions support the MABP or the CMABP hypothesis, but some do not.

Regarding the bias (of the offset coefficient), Kouri and Porter (1974) argue that the bias will be small as long as the Capital Model is well specified. However since Kouri and Porter drop some independent variables (chapter 3), namely W , W^* , Y^{n*} , from the model due to the data limitation and do not test statistically their model adequacy, the resulting estimators (including the offset coefficient) in the model may be biased and inconsistent but the direction of the bias is unclear. On one side, the condition of perfect capital mobility assumes complete offsetting (upward bias), on another side, they also recognize that (1) the Authorities may sterilize the inflows of capital creating a simultaneous relationship between ΔD and K (downward bias), (2) there is a specification error due to the exclusion of some key variables, downward or upward bias (Branson 1975). The importance of the downward bias due to the use of a single estimation procedure method is stressed in the study by Hallwood-MacDonald (1986) whereby the offset coefficient drops from a significant number (using OLSQ) to an insignificant one (using 2SLSQ). Only Genberg (1976) and Uddin (1985) employ an estimator which accounted for simultaneous equation bias by using 2SLSQ on equation 4.2.1.1 jointly with another equation specifying the Authorities reaction function. However Laskar (1983) argues that the exclusion of an exchange rate expectation variable from the equation 4.2.3.1 may lead to an upward bias of the offset coefficient because reserve outflows may cause speculators to expect devaluation leading to more capital outflows and further loss of international reserves. The debate about the bias does not end here because the critics of the MABP argue that the above inverse relationship may reflect the intervention policies adopted by the central bank; an inflow of reserve will cause the Authorities to contract domestic assets to stop the flow. This, in turn, may lead to a magnification of the offset coefficient. Although Genberg (1976) disagrees with this view, some studies support this argument. Eventually Magee (1976) concludes that without proper specification and proper

estimation (single versus simultaneous techniques), the bias is still there. It is questionable whether the coefficients in the equation 4.2.3.1 reflect a money demand equation or simply the effects of money supply on the independent variables of the models since the money supply influences work in the same direction as the demand side ones. Adversely, despite researchers having overcome the bias by utilizing the simultaneous method, the other bias may still occur because in estimating the models, it is assumed that domestic price, domestic income, domestic interest rate and domestic assets are exogenous; they are not affected by money supply. However in reality this may well not be the case. For example, an increase in the domestic assets may affect the other variables on the right hand side of the equation (Y , P , and i). Accordingly it leads to a further simultaneous bias.

Cross Section vs Time Series Data

While there have been some studies using cross-section data at a variety of levels of aggregation, the vast majority of studies employ highly aggregated time series data. A problem may arise due to the issues of aggregation as the balance of payments theories pertain to an individual behavioural unit which is estimated with aggregate data without regard for consideration of aggregation. This failure may lead to the omission of potential variables. The use of cross section data (Aghevli-Khan 1977, Connolly-Taylor 1976) is also questionable since it fails to catch the essence of a nation's economy through time. Moreover their results do not represent the balance of payments behaviour of an individual country. Thus, from a policy perspective, there is a potential hazard of applying the cross section model generally as a guideline to any specific country. Not only is the model unlikely to characterize adequately the economic process of the country, but also policy prescriptions based on it may be misleading. Whenever

possible, a country by country modelling approach using annual time series data is recommended in tracking the essence of a country's economic structure over time (in the long run).

Annual vs Quarterly Data

Most early studies employed annual observations, but increasingly the focus has been on shorter periods such as quarterly. This shift stems from the recent availability of short period data. For long-run perspective, annual data is more helpful for guiding macroeconomic policy since it tracks economic variables in a historical sense. Laidler (1985) adds that annual data are less subject to simultaneity bias than that of quarterly data. Basically the bias comes from the fact that the endogenous variables are "polluted" by random fluctuation; for example the variability of ΔD is dominated strongly by the movement in ΔR on monthly or quarterly basis. Accordingly studies employing longer term period data are less likely to be contaminated by the bias than those of employing short period data; since switching from quarterly to annual data has a smoothing effect to "dampen" the bias. For the shorter run analysis, however, it is preferable to employ quarterly data. Another interesting result is that the regressions show estimations are sensitive to the types of data employed. The study by Zecher (1976) for example supports the MABP hypothesis by using semi-annual data, however, by using quarterly data leads to the rejection of the hypothesis.

The Definition of Money

Empirical studies of the MABP and the CMABP hypotheses have been carried out under the assumption that they were general theories of the balance of payments which were applicable regardless of the particular definition of variables utilized.

Nevertheless, this is not the case. The actual definition of money does have important implications for the relevant form of the functions (whether money is defined narrowly or broadly). In fact there is no consensus about the definition of money employed by researchers. Although Friedman and Schwartz (1970) argue that the correct definition of money is an empirical issue, however, this approach leads to a danger since the definition of money may be chosen to "match" a particular theory. Some researchers in fact use broad definitions of money ²⁶, such as Genberg (1976), Bhatia (1982), while others employ the narrow one. A wider definition of money needs to take account of speculative or portfolio, demands for money. The major problem is that (1) a wider definition of money does not capture transactions balances only (the balance of payments transaction in less developed economies like Indonesia are mostly dominated by current transactions not asset transactions), and (2) the wide money may involve a high degree of simultaneity between demand for and supply of money. It means that the use of non simultaneous procedures are unlikely to identify a demand relationship. From a policy perspective in developing economies, it is advisable to use narrow money (which is regarded as readily available means of exchange) which is prominently determined by transaction and precautionary motives. Monetary policy especially in developing countries are thought to be explained in terms of narrow money or the monetary base (the assets held by the Authorities as reserves) so they are more likely to be under control of the Authorities. Not like the wide money which involves a high degree of simultaneity between demand for and supply of money, the narrow money most likely to be determined by the demand side, for this reason the simultaneous equation bias is at minimum; it justifies the use of non simultaneous procedures. Moreover models based on the transaction motives will provide greater guidance for the

²⁶For the definition of money (narrow or broad), see chapter 5.

policymaker in developing countries since most of the balance of payments transaction are dominated by the current transaction not the capital transaction due to the fact that the financial markets is not yet well developed.

The Definition of Income

There are several definitions of income used by researchers, namely domestic nominal income, domestic real income, Gross National Product (GNP), Gross Domestic Product (GDP), as well as seasonal or permanent income. Some researchers have in fact used permanent income (Bhatia 1982 and Uddin 1985) measured as an exponentially weighted averaged of current and past values of GNP. There are some potential problems using these seasonally adjusted income data. Though it may be useful to adjust seasonally a single data series like income in order to isolate its underlying trend. As far as a key relationship is concerned, it is only residual seasonally in the error term (vi) that needs to be removed. It should not be automatically assumed that individuals make decisions in terms of seasonally adjusted data, and even if they make some adjustments, it is unclear as to what kind of seasonal adjustment procedure they use. Moreover, the separate adjustment of time series (for example income variable alone without the other variables to be adjusted) may distort the regression estimates; it may induce problems in identifying the true lag structure. The relationship between series can therefore be distorted because series are incorrectly adjusted, separate filters are applied to different series, and some series are not adjusted at all.

The Definition of the Opportunity Cost of Holding Money

Another measurement issue is presented by the opportunity cost of holding money. Under the "transaction view", the relevant alternative is a bond. However as a practical matter, most researchers employ the yield on short term government securities, the yield on short term ²⁷ commercial paper, and the deposit rate; there were several interest rates for the studies, but the choice has been regarded as contentious. Contrastingly Aghevli-Khan (1977) for example use the inflation rate as the opportunity cost of holding money in developing economies. This is credible since (1) in a period of high inflation, domestic residents are reluctant to hold money; (2) although there are several interest rates against the opportunity costs of holding money but most interest rates in developing nations are regulated; they are not determined by the market mechanism, thus the pressures of demand and supply will not be reflect in those interest rates, (3) transaction motives dominate other motives in holding money. For that reason, among several interest data it is preferable to use the lending market rate for developing nations since this relates directly to transactive motives ²⁸. This rate may be classified as a representative indicator of the opportunity cost of holding money in developing countries.

²⁷Another issue is which interest rate to be used; short term or long term that may be considered as a close substitute for money.

²⁸Additional feature of the money market in developing countries is called the "financial dualism" (Ghatak 1981). It implies the co-existence of heterogenous interest rates in the organized (where the demand for money varies with interest rates) and unorganized (where the demand for money does not vary with interest rates) money market.

4.2.2.4. Econometric Issues

Heteroscedasticity

Because the OLSQ technique gives too much weight to the observations with large error variance, this leads to the problem of unequal variance in the model $[E(v_i^2) = \sigma_i^2]$. Unfortunately, all studies do not provide the information such as the Goldfeld-Quandt test and the Park test to detect the problem of heteroscedasticity. It may be that their standard errors are overestimated in most of the studies, particularly in the cross-section studies by Connolly-Taylor (1976) and Aghevli-Khan (1977) in which the problem of non homoscedastic is more likely.

Autocorrelation

The problem of autocorrelation $[E(v_i v_j) = 0, \text{ where } i \neq j]$ may lead to an underestimate of the standard errors (σ) of the regression coefficients, consequently the parameter estimates are less precise than without the problem. Most studies supply the Durbin Watson test, though some studies do not (Genberg, 1976; Connolly-Taylor, 1976 and Aghevli-Khan, 1977). However, it is suspected the problem of serial correlation in some autoregressive results (Kouri-Porter 1974) because Kouri and Porter use lags for their independent variables but the Durbin-h test were not reported.

Multicollinearity

Although the problem of multicollinearity (when two or more independent variables are correlated with each other) is easy to detect by examining the correlation matrix, however, all the studies do not provide the information. One obvious indication

of the existence of autocorrelation in the studies is that the coefficient determination is significant (high R^2) but the regression coefficients are insignificant (low t values), for example in the studies by Uddin (1985) and Aghevli (1977). The problem may be due partly to the collinearity between the price level and the inflation. Whether a great deal of confidence can be established in the studies is uncertain. Consequently the value of the population coefficients cannot be precisely estimated in the presence of multicollinearity because of the large variance estimators.

Lags

Some studies utilizes lags as an important element in their models. It is reasonable that there may be lags in the formation of expectations or in the adjustment to equilibrium. However, there are costs involved; the loss of degrees of freedom and the emergence of multicollinearity. After all, the lagged values of time series will be statistically correlated with the current or other past values of the independent variables of the same series.

Simultaneous Equation Bias

The endogeneity of the right-hand-side variables of the Reserve and the Capital models (for example ΔD and Y variables) raises an issue which econometricians refer to as the simultaneous equation bias. The additional bias arises in the presence of error terms peculiar to the application of regression analysis. Specifically, when variables endogenous to the economic system turn up as explanatory variables on the right side of the models, the simultaneity problem originates because these variables in their turn are also determined elsewhere in the system. However, although 2SLSQ has been employed

frequently, in many cases the results do not seem to make very much difference. This may be due to the simultaneous equation bias not being a major problem in that context since Kennedy (1979) asserts that, for some studies, the method of OLSQ is justifiable; Montecarlo studies shows that 2SLSQ estimates for small samples are biased and have higher standard errors than their corresponding OLSQ estimates. In fact Cooley-Leroy (1981) adds that an inappropriate choice of instruments causes 2SLSQ results also to be biased as the OLSQ estimates. Thus, it is by no means clear that the 2SLSQ are superior to the OLSQ estimates for the problem of simultaneity, although from a theoretical view the 2SLSQ method is preferable than that of OLSQ.

Technical Assumptions

With regard to technical assumptions, several studies assume that there is no money illusion in the economy (Aghevli-Khan 1977, and Uddin 1985) without further testing this assumption. Various tests such as Lagrangian Multiplier (LM) and Likelihood Ratio (LR) tests should be performed to check the validity of the assumptions contained therein. From a modelling perspective, whilst a model can be based on a set of prior restrictions that are believed to be theoretically valid, the imposition of any further technical restriction ought to be tested statistically.

4.2.5. Summary and Conclusions

Over the past two decades, researchers tested the MABP and the CMABP propositions for both developing and developed countries in the form of Reserve (RM), Capital (CM) and Simultaneous (SM) models. The models were designed to provide a framework for quantitative analysis that could be used as a guide for policymakers, unfortunately the empirical results to date are indecisive and suffer from methodological problems. The Reserve (RM), the Capital (CM) and the Simultaneous (SM) models do not provide complete answers. The studies indicate that researchers employ dissimilar specification methods, different data sets, different estimation procedures and different time periods in examining the MABP and the CMABP hypotheses; no consensus with regard to those matters.

There appears to be disagreement concerning appropriate functional relationship of the models and the controversy over single equation versus simultaneous equation system. The problem of specification error can also be avoided by diagnostic tests as a means of evaluating model adequacy prior to the examination of the theoretical prediction to bypass the spurious inference from the misspecified model. The polemic seems to continue among researchers. The primary progress of the empirical studies has been on employing a better quality of data and more observations, on improving the specification and on using more appropriate econometric tests.

The hypothesis that domestic assets play a significant role in the determination of the balance of payments remains unclear. This conclusion, however, may depend upon particular definitions of data and upon the time period of analysis. The empirical analysis presented do not strongly suggest the robustness of the sterilization hypothesis, particularly that a change in the domestic monetary base will result in an equiproportionate change in the foreign exchange reserves or in the flows of capital.

APPENDIX 4A

Survey of the Empirical Works on the MABP and the CMABP hypotheses ²⁹

No	Year	Researcher	Country	Data	Period	Method	Finding*
1	1974	Kouri-Porter	Italy	Quarterly	1964-1970	OLSQ	H1
2	1974	Kouri-Porter	Germany	Quarterly	1964-1970	OLSQ	H2
3	1974	Kouri-Porter	Netherlands	Quarterly	1964-1970	OLSQ	H0
4	1974	Kouri-Porter	Australia	Quarterly	1964-1970	OLSQ	H2
5	1976	Zecher	Australia	Semi-Annually	1961-1972	OLSQ	H2
6	1976	Bean	Japan	Quarterly	1959-1970	OLSQ	H2
7	1976	Genberg	Sweden	Quarterly	1951-1970	2SLSQ	H0
8	1976	Guillian	Spain	Annually	1951-1970	OLSQ	H2
9	1976	Conolly-Taylor	LDCs**	Quarterly	1959-1970	OLSQ	H0
10	1976	Hodjera	Austria-France	Quarterly	1960-1971	OLSQ	H1
11	1977	Aghevli-Khan	LDCs***	Annually	1957-1966	OLSQ	H2
12	1982	Bhatta	India	Quarterly	1951-1973	OLSQ	H0
13	1985	Uddin	India	Annually	1960-1980	2SLSQ	H1
14	1985	Uddin	Pakistan	Annually	1960-1980	2SLSQ	H1
15	1985	Uddin	Thailand	Annually	1960-1980	2SLSQ	H1
16	1992	This Thesis	Indonesia	Annually	1960-1988	OLSQ	H1

²⁹See Appendix 4B for complete models and their coefficients. Unless otherwise indicated, the data is time series.

* The overall and final conclusion based on all regressions in the researcher's work.

** Argentina, Columbia, Costa Rica, Ecuador, Finland, Iceland, India, Israel, Korea, Peru, Philippines, Tunisia, Turkey, and Venezuela (Cross-Section Data)

*** Argentina, Bolivia, Brazil, Chile, Columbia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela, Ethiopia, Kenya, Morocco, the Sudan, Tanzania, Tunisia, Uganda, Sri Lanka, India, Iran, Israel, Pakistan, Cyprus, Greece, Turkey, the Republic of China, Korea, the Philippines, Thailand, Malaysia (Cross-Section Data).

APPENDIX 4B

Notes

- ✓✓ means the sign is in accordance with the theoretical expectation
 x means the sign is not in accordance with the theoretical expectation
 ✓ means the sign is in accordance with the theory however the magnitude of the coefficient is unexpectedly small or big
 ? means the sign can be positive or negative
 – means the information is not available

For complete definition of symbols used in the regression, see chapter

The figures in brackets are t-values

The estimated coefficients are rounded to two decimals

The Reserve & the Capital Models and their Estimated Parameters

No	Regression Model	R ²	σ	DW
1. CM	$K = 84.84 + 0.027 \Delta Y_n - 51.35 \Delta i^* - 0.43 \Delta D + 0.98 CB$ (6.26) (1.22) (4.36) (4.95) ✓✓ ✓✓ ✓ x	0.67	132	2.55
2. CM	$K = 238.5 + 0.11 \Delta Y_n + 115.4 \Delta i^* - 0.77 (\Delta D - \Delta R) - 0.95 CB$ (4.11) (0.45) (18.40) (10.85) ✓✓ x ✓✓ ✓✓ $+ 1798 \Delta d1 + 2027 \Delta d2 + 2703 \Delta d3 + 1783 \Delta d4$ (2.91) (3.11) (2.92) (7.16) ? ? ? ?	0.96	816	2.17
3. CM	$K = 88.98 + 0.021 \Delta Y_n - 94.09 \Delta i^* - 0.59 \Delta D - 0.98 CB$ (5.01) (1.62) (7.59) (10.88) ✓✓ ✓✓ ✓ ✓✓	0.82	193	2.54
4. CM	$K = 78.16 + 0.057 \Delta Y_n - 11.84 \Delta i^* - 0.47 \Delta DC - 0.63 CB - 216.2 d1$ (2.84) (0.79) (5.29) (6.74) (6.08) ✓✓ ✓✓ ✓ ✓ ?	0.82	63.9	1.88
5. RM	$R/H \Delta \log R = 2.07 \Delta \log Y_r - 0.059 \Delta \log i - 0.87 \Delta \log P$ (6.17) (0.55) (-1.31) ✓✓ ✓✓ x $- 0.64 \Delta \log \lambda - 1.13 DC/H \Delta \log DC$ (-5.05) (-17.03) ✓ ✓✓	0.89	–	1.70
6. RM	$R/(R+DC) \Delta \log R = 1.19 \Delta \log P + 0.52 \Delta \log Y_r - 0.11 \Delta \log i$ (5.38) (6.36) (-1.22) ✓✓ ✓✓ ✓✓ $- 0.82 \Delta \log \lambda - 0.67 D/(R+DC) \Delta \log DC$ (-5.29) (-8.32) ✓✓ ✓	0.65	0.021	1.99

7 SM	$R/H \Delta \log R = 0.03 - 1.11 \frac{DA}{H} \Delta \log DA - 0.53 \frac{\Delta \log \lambda}{\sqrt{\lambda}}$ $+ 0.81 \frac{(\log P - \alpha \log P - 1)}{\sqrt{P}} + 0.02 \frac{(\log Y_n - \alpha \log Y_n - 1)}{Y_n}$ $- 0.00 \frac{(\log i_r - \alpha \log i - 1)}{\sqrt{i}} - 0.00 \frac{\log M^S - 1}{M^S}$ $DA/H \Delta \log D = 0.015 - 0.88 \frac{R}{H} \Delta \log R - 0.02 \frac{\Delta \log GD}{\sqrt{GD}}$	-	-	-
8 RM	$\Delta R = 9.28 - 0.08 Y_n + 0.16 P + 0.22 P^* - 0.96 \Delta DC$	0.95	-	2.36
9 RM	$\Delta \Delta R/M = 0.29 \frac{\Delta \Delta \xi / \xi}{\sqrt{\xi}} - 0.82 \frac{\Delta \Delta DA/MS}{\sqrt{MS}}$	0.65	0.20	-
10 CM	$K_s = 667.38 + 194.65 \Delta i^* - 402.32 \Delta i^{*-1} - 0.25 \Delta DA$ $- 0.09 \Delta DA - 1 - 0.43 CB + 0.15 CB - 1 - 0.05 Y_n - 0.09 Y_n - 1$ $- 428.30 d_1 - 4577.13 d_2$ $K = 1437.53 + 115.88 \Delta i - 676.17 \Delta i^{*-1} - 0.39 \Delta DA$ $- 0.19 \Delta DA - 1 - 0.79 CB + 0.002 CB - 1 - 0.11 Y_n - 0.17 Y_n - 1$ $- 661.07 d_1 - 4727 d_2$	0.79	721.7	2.00
11 RM	$R/H \Delta R/R - 1 - \Delta P/P - 1 = -7.33 + 1.14 \frac{\Delta Y/Y - 1}{\sqrt{Y}} - 0.50 \frac{\Delta P/P - 1}{\sqrt{P}}$ $- 0.79 \frac{(\Delta \lambda/\lambda - 1 + DC/H \Delta DC/DC - 1)}{\sqrt{\lambda}}$	0.74	5.46	-
12 RM	$R/H \Delta \log R = -0.01 + 0.89 \frac{\Delta \log Y_r}{\sqrt{Y_r}} - 0.11 \frac{\Delta \log i}{\sqrt{i}} - 0.99 \frac{\Delta \log \lambda}{\sqrt{\lambda}}$ $+ 0.73 \frac{\Delta \log P}{\sqrt{P}} - 1.23 \frac{DC/H \Delta \log DC}{\sqrt{DC}}$	0.77	0.036	1.95

13 SM	$R/(R+DC) \Delta R/R-1 = -0.06 - 0.09 \Delta P/P-1 + 0.14 \Delta Y_T/Y_T-1$ $\begin{matrix} (-0.77) & (0.79) \\ \times & \sqrt{\sqrt{}} \end{matrix}$ $-0.15 \Delta i/i-1 + 0.52 DC/(R+DC) \Delta DC/DC-1$ $\begin{matrix} (-1.07) & (2.47) \\ \sqrt{\sqrt{}} & \sqrt{} \end{matrix}$ $DC/(R+DC) \Delta DC/DC-1 = 0.07 + 0.30 R/(R+DC) \Delta R/R-1$ (0.36) $\begin{matrix} \times \\ (0.48) & (0.36) & (0.89) \\ ? & \sqrt{\sqrt{}} & ? \end{matrix}$	0.15	-	2.64
		0.41	-	2.61
14 SM	$R/(R+DC) \Delta R/R-1 = 0.003 - 0.006 \Delta P/P-1 + 0.21 \Delta Y_T/Y_T-1$ $\begin{matrix} (0.04) & (0.51) \\ \times & \sqrt{\sqrt{}} \end{matrix}$ $-0.13 \Delta i/i-1 - 0.015 DC/(R+DC) \Delta DC/DC-1$ $\begin{matrix} (-1.21) & (-0.07) \\ \sqrt{\sqrt{}} & \sqrt{} \end{matrix}$ $DC/(R+DC) \Delta DC/DC-1 = 0.16 - 1.30 R/(R+DC) \Delta R/R-1$ $\begin{matrix} (-1.53) \\ \sqrt{\sqrt{}} \end{matrix}$ $+ 0.28 \Delta G_d/G_d-1 - 0.41 \Delta P/P-1$ $\begin{matrix} (3.19) & (-1.74) \\ ? & \times \end{matrix}$	0.26	-	1.35
		0.62	-	1.93
15 SM	$R/(R+DC) \Delta R/R-1 = 0.007 + 0.036 \Delta P/P-1 + 0.42 \Delta Y_T/Y_T-1$ $\begin{matrix} (2.09) & (1.70) \\ \sqrt{\sqrt{}} & \sqrt{\sqrt{}} \end{matrix}$ $+ 0.001 \Delta i/i-1 - 0.71 DC/(R+DC) \Delta DC/DC-1$ $\begin{matrix} (0.03) & (-5.65) \\ \times & \sqrt{\sqrt{}} \end{matrix}$ $DC/(R+DC) \Delta DC/DC-1 = 0.05 - 0.81 R/(R+DC) \Delta R/R-1$ $\begin{matrix} (-1.66) \\ \sqrt{\sqrt{}} \end{matrix}$ $+ 0.45 \Delta G_D/G_D-1 + 0.66 \Delta P/P-1$ $\begin{matrix} (3.13) & (3.21) \\ ? & \sqrt{\sqrt{}} \end{matrix}$	0.71	-	2.10
		0.50	-	2.15
16 RM	$R/H \Delta R/R-1 = 0.53 - 3.26 \Delta Y/Y-1 - 1.70 \Delta i/i-1$ $\begin{matrix} (-2.47) & (-4.06) \\ \times & \sqrt{\sqrt{}} \end{matrix}$ $+ 4.81 \Delta P/P-1 - 1.08 (\Delta \lambda/\lambda-1 + DC/H \Delta DC/DC-1)$ $\begin{matrix} (4.04) & (2.93) \\ \sqrt{\sqrt{}} & \sqrt{\sqrt{}} \end{matrix}$	0.73	0.20	2.25

CHAPTER 5

DATA ISSUES

5.1. Data Problems, Sources and Definitions

Any quantitative study of a developing economy faces severe difficulties in obtaining relevant data because of their scarcity, discontinuity, and inconsistencies in different official publications. The Balance of Payments Accounts have a short history in many developing countries, and Indonesia is no exception. The official publication of the Balance of Payments Accounts of Indonesia began in 1960 (15 years after the Indonesia's Independence in 1945) however the best available data were collected after 1966 when General Suharto took over the presidency from the *Partai Komunis Indonesia* (the Communist Party) in the 1965 revolution. Before 1966 there is much doubt as to the accuracy of the data. Many factors contribute to the inaccuracy of the available data. A high rate of illiteracy in Indonesia prevents a significant proportion of the population from keeping any accounts regarding their businesses. Even if this fact is ignored, a long period of distrust of the people for the previous government and lack of confidentiality of obtained data, in many circumstances, lead to incorrect and biased responses. The lack of experienced manpower and low priority of budget allocation for gathering statistical data added some difficulties in obtaining accurate data. In addition a major handicap is the influence of political pressure on the organizations, namely the Central Statistical Bureau of Indonesia (*Biro Pusat Statistik* or *BPS*) and the Bank of Indonesia (*Bank Indonesia* or *BI*) which are responsible for gathering data. Under the existence of the Sukarno's regime to make the ruler look impressive in the eyes of the people or more importantly in the international community in order to get more aid, the Balance of Payments Statistic often indicated

a constant improvement in the economy, although that may have not been the case.

Given the above-mentioned difficulties concerning data in Indonesia, one may wonder what the significance is of an empirical analysis for the Indonesian economy. It is obvious that in many cases the degrees of freedom are low because of scarcity of data; the parameter estimation may be distorted and biased due to error measurements. However the abandonment of efforts to quantify is not the solution. The empirical studies of Indonesia reveal the orders of magnitude, direction, policy analysis and speed of change in major economic variables. They also provide some understanding for the need of future research, for example in the present study of less aggregated data for different goods and services for examining the Elasticities Approach to the Balance of Payments (EABP) could not be employed because of lack of detailed information. The same thing occurs with the data on the asset markets for testing the Capital Market Approach to the Balance of Payments (CMABP). Since asset markets are not well developed in the economy, the data is not yet available.

Data are collected from the various publications of

1. the Central Statistical Bureau of Indonesia (BPS)
2. the Bank of Indonesia (BI)
3. the International Monetary Fund (IMF)

Because statistical data of Indonesia has been under constant revision in recent years, there are inconsistencies among various official publications regarding the data, however, the latest revision of the data will be utilized because the refined data resulting from the additional information reduces measurement errors. The purpose of this study is to empirically compare four competing theories of the balance of payments using data covering the 1960-1988 period peculiarly under the Suharto regime, 1967-1988, during the period of *Orde Baru*. All

data are collected on annual basis; using annual data avoids the problem of seasonality. For the sake of uniformity all data will be denominated in US dollars. However if the original figures are denominated in Indonesian rupiah or other currencies, the appropriate exchange rate (₹) at the end of the year will be used to convert the data into US dollars.

This chapter is divided into 2 sections. Section 5.1 discusses problems in gathering data, sources and definitions. Section 5.2 reports data descriptions.

All variables will be defined uniformly throughout all of the chapters. All figures after 1982 are collected from the latest revisions of the data.

SYMBOL OR NOTATION

A	Absorption (=C+I+GE)
C	Private Consumption Expenditure
CB	Current Account Balance
ΔD	Domestic Credit Expansion of the Bank of Indonesia consisting of Claims on Central Government, on Official Entities, on Private Sector, on Deposit Money Banks, and on Other Financial Instruments
DA or D	Domestic Assets of the Central Bank
DC	Domestic Credit to the Private Sector only
Er	or ₹, Exchange Rate
F	Foreign Assets of the Bank of Indonesia
G ^b	Government Bonds in the Private Sector
G ^d	Government Debts and Borrowings
GDP	Gross Domestic Product
GE	Government Expenditure
GNP	Gross National Product
GR	Government Revenue from Tax, Non-Tax and Grants
I	Gross Domestic Fixed Capital Formation
i	Nominal Interest Rate

K	Private Capital Inflows
M	Imports or Money
MPC	Marginal Propensity to Consume (χ)
MPI	Marginal Propensity to Invest (δ)
MPGE	Marginal Propensity to Undertake Government Expenditure (ψ)
MPM	Marginal Propensity to Import
MPX	Marginal Propensity to Export
M ^d	Demand for Money or Demand for Merchandise Import c.i.f
P	Domestic Price Index
P ^{rm}	Relative Price of Imports (P^m/P)
P ^m	Import Price Index
P ^{rx}	Relative Price of Exports (P^x/P)
P ^x	Export Price Index
R	International Exchange Reserves
TB	Trade Balance (= X-M)
W	Wealth
Y	Income { $Y = C + I + G + (X-M)$ }
X ^d	Demand for Merchandise Exports f.o.b

GREEK SYMBOLS

α	MPA = MPC + MPI +MPG or $\alpha=\chi+\delta+\psi$
ξ	Exchange Rate
ξ^e	Expected Exchange Rate
ρ	A Measure of Risk ($=\xi^e-\xi$)
σ or s	standard error of the model
λ	Money Multiplier
Π	Inflation
η_x	Price Elasticity of Export Demand
η_m	Price Elasticity of Import Demand
φ_x	Price Elasticity of Export Supply
φ_m	Price Elasticity of Import Supply
Δ	First Difference Operator
Σ	The Summation of Terms as Indicated

d	Total Differentiation
∂	Partial Differentiation

STATISTICAL ABBREVIATIONS

Adj.R ²	adjusted coefficient of determination, after corrected for the d.f
AR(1)	Autoregressive (first order)
BLUE	Best Linear Unbiased Estimate
CO	Cochrane and Orcutt Iterative Procedure
CUSUMSQ	Cumulative Sum of Squares
DW (d)	Durbin's d Statistic
DW (h)	Durbin's h Statistic for AR(1)
E	Expectation Operator
FIML	Full Information Maximum Likelihood
GF	Goodness of Fit Test
ILSQ	Indirect Least Squares
IV	instrumental Variables
L	Likelihood Function
LIML	Limited Information Maximum Likelihood
LM or Li	Lagrangian-Multiplier Statistic for i th degree (where i = 1 to 4)
log or ln	Logarithm to the Base e where e=2.7183
LR	Likelihood Ratio Test
m	Measure of Multicollinearity Effect
ML	Maximum Likelihood Statistic
OLSQ	Ordinary Least Squares
R	Multiple Correlation Coefficient
R ²	Multiple Coefficient of Determination
2SLSQ	Two Stage Least Squares

OTHER ABBREVIATIONS

AABP	Absorption Approaches to the Balance of Payments
EABP	Elasticities Approach to the Balance of Payments
CMABP	Capital Market Approach to the Balance of Payments
MABP	Monetary Approaches to the Balances of Payments

SABP	Structural Approaches to the Balances of Payments
SA	Stock Adjustment
SR	Short-Run Period
LR	Long-Run Period

SUPERSCRIPT

*	Foreign or World Variables
d	Demand Variables or Direct-Effect Variables
e	Expected or Anticipated Variables
i	Indirect-Effect Variables
s	Supply Variables
n	Nominal Variables
r	Real Variables

SUBSCRIPT

t	Variable at time t
ma	Modified Alexander Coefficient

5.2. Data Description

All data were found in the official publications of the BPS (Biro Pusat Statistik), the IMF (International Monetary Fund) and the Bank of Indonesia (BI). All annual data are quoted in US dollars covering the period of 1960-1988. However, if the original figures are denominated in Indonesian rupiah or other currencies, the appropriate exchange rate (₹) at the end of the year will be used to convert the data into US dollars.

Absorption (A) is defined as the use of goods and services for the purposes of consumption and investment by the private and

public sectors of the economy. It was calculated algebraically as $A=C+I+GE$. The original data is stated in Indonesia Rupiah.

Consumption (C) is specified as the expenditure by private sector not for the purpose of investment. The original source of data is the Central Statistical Bureau of Indonesia (BPS). The original data is stated in Indonesia Rupiah.

Current Account Balance (CB) is defined as an account of the Indonesian balance of payments which records international flows of goods and services, and other net income from abroad. The original data is denominated in US dollar.

Capital Flows (K) is defined as private capital inflows into the country. It is proxied by the Errors and Omissions (EO) data. The EO item in the balance of payments is largely unrecorded private financial capital. This view was confirmed by Branson (1968), latter on it has been used in official publications for example the OECD Statistic Balance of payments table carry EO as private short term monetary capital. The data will be utilized particularly for testing the Capital Model (CMABP). There are two types of capital flow data, one is published by the Central Statistical Bureau of Indonesia and the other by the Bank of Indonesia. Unfortunately there is discontinuity on the the Central Statistical Bureau of Indonesia's data, so the Bank of Indonesia's data will be employed instead. The original data is stated in US dollar.

Domestic Assets or Credits (D) is the instrument of monetary policy by the Bank of Indonesia involving the lending money to private and or public sector. The original figures are quoted in billions of Rupiahs from the Bank of Indonesia and the Central Statistical Bureau of Indonesia. At present, there are two types of credit creation data, one is from BI which reports Domestic Assets of Bank Indonesia (D) classified as the sum of claims on government, on deposit money banks, on official

on the private sector. Another domestic asset data comes from the Central Statistics of Indonesia which gives the amount of credit creation only to the private sector (DC); unfortunately it consists of only 25 yearly observations. For practical reasons, the data from the Bank of Indonesia is used. The original data is stated in Rupiah.

Domestic Income (Y) is specified as the amount of funds, goods, and services received by the economy in a given time period. Since GNP and GDP at current prices can be a misleading indicator of the economic performance, the GNP and GDP deflator is used to obtain GNP and GDP at constant prices as a more reliable indicator by adjusting the inflationary level. In this study, GDP is used as a proxy for domestic capacity utilization in formulating the export models whilst GNP is used as a proxy for national buying power in formulating the import models. The original data is stated in Rupiah.

Exchange Rate (ξ) or Er in this survey is defined as the price of foreign currency, particularly US dollars and IMF Special Drawing Right, in terms of Indonesian Rupiahs. The Central Statistics of Indonesia carries time series of exchange rates expressed in US dollars per Indonesian Rupiahs and other rates for the Special Drawing Right (SDR) value of Indonesian Rupiahs. Each variable carries two kinds of series, the-end-of-period rates and arithmetic-average series. The exchange rate (US dollar) at the end of the year is employed because (1) it is preferable since the other data are collected at the end of the year, and (2) most international transactions in the market involves US dollars (the US is Indonesia's major trading partner besides Japan; more than sixty per cent of Indonesian international transaction is with the USA). If original data is stated in Indonesian Rupiah, the exchange rate will be employed for conversion into US dollar values.

Exports (X) is defined as the US dollar value merchandise trade goods which are produced in Indonesia, sold to and consumed in other countries. The exports data is reported in f.o.b basis based on the Indonesian Custom Statistics. Indonesia's exports are dominated by primary commodities (The quantity of exports is derived from the value of exports divided by relative export prices. This quantity of exports will be employed to derive the demand for and supply of imports and exports to find elasticity figures).

Export Price (P^x) is defined as exports unit value index, compiled from the IMF survey data (expressed on base 1985=100).

Government Debts and Borrowings (G^d) are defined as any borrowing of finance or assistance given to Indonesia which would not generally have been provided by natural market forces. Basically it is the sum of foreign borrowings and outstanding debts by the Indonesian government denominated in billions of rupiah. The data is calculated separately from the original sources of the Bank of Indonesia and the Central Statistical Bureau of Indonesia. For years, Indonesia's economy has been saddled with foreign debts to boost the development of *Pembangunan Lima Tahun* (Five Year Plan). Among the major creditors, Japan is only slightly behind the USA. The original data is stated in Rupiah.

Government Expenditure (G or GE) is expenses made by the Indonesian government as an element of fiscal policy to finance the economy development. The original figures are quoted in billions of Indonesian rupiah. The expenditure data will be employed in particular to test the Absorption Approach (AABP) since government expenditure is a part of total absorption in the economy. The main source of the data is the Central Statistical Bureau of Indonesia (BPS). Actually government expenditure can be divided into two broad categories,

expenditure for routine and expenditure for development. However, it is difficult to distinguish between government current and capital expenditure. In fact the the distinction becomes unclear in practice, at the same time it is not possible to obtain or to divide the data along functional lines. For that reason, the total figures from the BPS are employed. The original data is stated in Rupiah.

Government Revenue (GR) is specified as the amount of Indonesian government earnings by collecting taxes, non taxes and foreign grants. The data are originally reported in billions of rupiah. The main source of data is the Central Statistical Bureau of Indonesia (BPS). At present the majority of tax revenue comes from indirect taxes (mainly on imports) and from non-tax income (mainly from petroleum export); the government revenue is heavily dependent on the country's capacity both to import and export. The original data is stated in Rupiah.

Import (M) data is defined as the US dollar value merchandise imports at c.i.f basis. This study used merchandise import at c.i.f basis rather than at f.o.b since it represents a more accurate value of imports by including the costs of transportations and insurance. Indonesia's imports are dominated by capital investments, machines for agriculture, manufacturing, mining, public utilities and the like for the economy development; the others are imports of processed foodstuff, textiles, consumer durables, and imports of raw materials such as raw cotton, synthetic fibres, yarn, cement, steel products, fertilizer, and insecticides (The quantity of import is found by dividing the value by the relative import price. The quantity of import data will then be used to derive demand and supply equation for imports and exports to find elasticity figures).

Import Price (P^m) is defined as imports unit value index, compiled from the IMF survey data (expressed on base 1985=100).

Interest Rate (i) is defined as the cost of borrowing reported in percentage per annum by the Bank of Indonesia. There are several types of interest rates, i.e (1) money market rate is the rate at which short-term borrowings are effected between financial institutions, (2) deposit rate is the rate offered to Indonesian resident customers for demand, time, and savings deposits, and (3) lending market rate is the rate to meet the short and medium term financing needs of the private and public sectors. The data shows that most interest rates stay flat in Indonesia particularly before 1970; it does not reflect fully the movement in the market forces except the lending money market rate. The interest rates are the most difficult data to collect, discontinuity, and incompleteness among all variables.

International Reserves (R) is specified as the stock of foreign currency, gold, Standard Drawing Rights (SDR) and reserve position in the International Monetary Fund for the purpose of international transactions. There are three types of international reserves namely (1) narrow reserves consists of foreign exchange reserves only, (2) broad reserves consists of the sum of foreign exchange reserves, SDRs and reserve position in the Fund, (3) very broad international reserves consists of the broad reserves plus stock of national gold. This study uses the second one (broad reserves). The original data is stated in US dollar.

Investment (I) or gross domestic fixed capital formation is defined as the flow of expenditures in the economy devoted to projects producing goods or services which are not intended for immediate consumption. The original data is stated in Rupiah.

Money Supply (M) is specified as the amount of money and the medium of exchange (M2) in circulation in the Indonesian economy. M2 gives a broader measure of money which equals to the M1 (the sum of currency outside Indonesian banks and private sector demand deposit) plus time, savings, and foreign currency deposits of Indonesia's residents. The original data is stated in Rupiah.

Money Multiplier (λ) gives the change in the money stock for a Rp 1 change in the quantity of monetary base. The money multiplier is obtained by dividing money stock with money base (money stock = money multiplier \times monetary base). Since there are three measures of money stock (M_1 , M_2 and M_3), accordingly three kinds of money multiplier will be available, i.e, narrow money multiplier (λ_1), broad money multiplier (λ_2), and very broad money multiplier (λ_3). The broad money multiplier will be employed for the sake of consistency (M_2). All data are calculated separately from the original sources of the Central Statistical Bureau of Indonesia.

Nominal Effective Exchange Rate (ξ) is defined as the price of foreign currency, particularly US dollars and IMF Special Drawing Right, in terms of Indonesian Rupiahs (expressed on base 1985=100). The IMF and BPS carries time series of exchange rates expressed in two kinds of series, the-end-of- period rates and arithmetic-average series. In this study, the exchange rate at the end of the year is employed because most other data are collected at the end of the year.

Price Level (P) means the average domestic price of goods produced in the economy reflected by Consumer Price Index (CPI). Actually there are three indexes available, Consumer Price Index (CPI), Wholesale Price Index (WPI), and Crude Petroleum Production Index (CPPI). CPI reflects the importance in consumption of different components of a fixed basket of goods and services that an average Indonesian consumer

purchases. WPI is designed to track changes in prices of items at the level of their first important commercial transactions; it reflects changes in prices of a mixture of commodities at various stage of production and distribution mostly in the agricultural sector and in the industrial production sector while CPPI is more concentrated in the petroleum industry. Because of the unavailability of the data, the index figures prior to March 1979 are based on an index which covered only one capital city of Indonesia (Jakarta). After 1979 the index covers 17 capital cities throughout Indonesia. Since the objective of this paper is to formulate macroeconomic policy for the whole sectors, the index of CPI will be used throughout the study because it is more relevant than the others. Additionally the WPI data is not available and incomplete for certain years. The CPPI, on the other sides, represents just the oil sector industry, not an accurate description of the Indonesian industry as a whole. The data indicates that the CPPI fluctuates considerably adjusting with the condition of the world oil markets, whereas the CPI increases gradually. The main source of the data is from the Central Statistics of Indonesia. The data were recalculated from the original source, and rebased to the year of 1985. The reason for using 1985 as a base year is that the year is regarded more stable economically than the other years.

Trade Balance (TB) is the value of net exports ($X-M$) however since there are several measures of exports and imports, only one measure of trade balance will be used; trade balance is defined as the difference between Merchandise Export f.o.b and Merchandise Import c.i.f. The data were calculated separately from the original figures in US dollars which comes mainly from the Central Statistical Bureau of Indonesia.

World Income (Y^*) should be weighted by reference to the geographical structure of the Indonesian exports. However, because of the difficulty in obtaining the geographical structure of domestic exports and because statistical data of

Indonesia has been under constant revision in recent years, there are discontinuity regarding the data. Accordingly world income data is compiled from the IMF survey data. It is proxied by average income of the industrialized countries. World Price Level then is used to obtain World Income at 1985 constant prices as a more reliable indicator by adjusting world inflationary level. The original data is stated in US dollar.

World Interest Rate (i^*) is proxied by USA money market rate because of the difficulty in obtaining world interest rate before 1970. However the rate follows closely the movement of the London Interbank Offer Rates on US Dollar Deposits.

Since this study empirically compares the balance of payments theories (the Elasticities Approach, the Absorption Approach, the Monetary Approach, and the Capital Market Approach and the Structural Approach), the same time period and the same types of data must be employed to test the validity of each theory otherwise the comparisons will be meaningless. This comparative study uses 22 in number of annual observations from 1967 to 1988 for the period of Orde Baru (chapter 6), and 29 in number of observations from 1960 to 1988 (chapter 7).

CHAPTER 6 THE BALANCE-OF-PAYMENTS COMPARISONS

6.1. THE ELASTICITIES APPROACH TO THE BALANCE OF PAYMENTS (THE ELASTICITIES MODEL)

Within the international trade literature, it is not uncommon to find arguments about whether a change in the price of a nation's currency will improve a nation's trade balance. The Elasticities Approach to the Balance of Payments (EABP) describes the condition for an improvement in the nation's trade balance in terms of price elasticities of imports and exports. The well-known Marshall-Lerner condition must be fulfilled if devaluation is to ameliorate the trade balance, that is $dTB/d\xi > 0$ if

$$\{ \varphi_x(\eta_x - 1) (\varphi_x + \eta_x)^{-1} \} + \{ \eta_m(1 + \varphi_m) (\varphi_m + \eta_m)^{-1} \} > 0 \quad 6.1$$

where TB stand for trade balance, ξ for exchange rate, X for exports, M for imports, d for differentiation, φ_x for the elasticity of export supply, η_x for the elasticity of export demand, η_m for the elasticity of import demand and φ_m for the elasticity of import supply.

In the case of a small country like Indonesia, the necessary condition for devaluation ¹ to improve the trade balance is if

¹Devaluation in this study refers to both informal and formal changes of the exchange rate. The formal change is small adjustments of the

the total of the price elasticities of demand for exports and imports exceeds one. Accordingly, by finding the limit ($\varphi_x = \varphi_m = \infty$) of equation 6.1, it yields

$$\lim_{\varphi_x, \varphi_m \rightarrow \infty} [\{ \varphi_x (\eta_x - 1) (\varphi_x + \eta_x)^{-1} \} + \{ \eta_m (1 + \varphi_m) (\varphi_m + \eta_m)^{-1} \}] \quad 6.2$$

$$\frac{dT_B}{d\xi} > 0 \quad \text{if} \quad \eta_x + \eta_m > 1 \quad 6.3$$

and the sufficient condition for devaluation to improve the trade balance is if the sum of the price elasticities of demand for imports and of supply of exports is greater than zero. Then by taking the limit ($\eta_x = \varphi_m = \infty$) of equation 6.1, it yields

$$\lim_{\eta_m, \varphi_m \rightarrow \infty} [\{ \varphi_x (\eta_x - 1) (\varphi_x + \eta_x)^{-1} \} + \{ \eta_m (1 + \varphi_m) (\varphi_m + \eta_m)^{-1} \}] \quad 6.4$$

$$\frac{dT_B}{d\xi} > 0 \quad \text{if} \quad \varphi_x + \eta_m > 0 \quad 6.5$$

The EABP views devaluation as the potent mechanism of adjustment; it suggests the computation of the above price elasticities as the analytical tool by which macroeconomic policies (such as exchange-rate, monetary, fiscal and commercial policies) can be adopted to achieve the balance of payments target. If the above conditions are satisfied, the devaluation will be succesful. However, according to the "J-Curve Effect" hypothesis, the short-run effect of a devaluation may worsen the trade balance, before improving it after a lag of some 3 months to 3 years ².

The main purpose of this section is to estimate the above price elasticities which are relevant to macroeconomic policy issues

exchange rate from time to time undertaken by the Bank of Indonesia, whereas the formal changes are large adjustments announced officially by the Indonesian government.

²For theoretical discussion of the "J-curve effect" hypothesis see Winters (1988), whereas for empirical analysis see Artus (1973), Magee (1974).

in Indonesia. Further it tries to examine the impact effect of the price elasticities by using a Stock Adjustment (SA) ³ mechanism to investigate the "J-Curve Effect" hypothesis in the economy or particularly to analyze the short-run (SR) and long-run (LR) elasticities in relation to the Marshall-Lerner condition. This section will also examine the transmission of the nominal exchange-rate onto domestic prices (the so-called "pass-through" coefficient), the stability of the pass-through coefficient, as well as the transmission of import prices onto domestic prices (the so-called "imported inflation" hypothesis). The transmission of exchange rate and import price variables onto domestic price is important in analyzing the final effect of devaluation. If the transmission coefficients are significant, devaluation will induce higher domestic price thereby accelerating inflation. Accordingly the benefit of the price effects on the imports and exports induced by the devaluation would be negated by inflationary effects of the devaluation.

This section consists of two parts. Part 6.1.1 describes the methodology (functional forms and specifications of the EABP hypothesis) while part 6.1.2 discusses empirical results, and conclusions. Different estimation techniques for both single and simultaneous equations will be presented. The estimations are based on 29 annual observations on Indonesian aggregate merchandise trade data for the period of 1960 to 1988. All trade variables are expressed in real terms, 1985 constant price (see chapter 5, for data sources and statistical notation).

³While there is a consensus on the presence of time lag, there is no consensus on the proper distributed lag pattern (Goldstein-Khan 1985). Alternative lag specifications such as Koyck, Almon and Polynomial were not tried in this study owing to the limited amount of data and the difficulty of handling such information in a simultaneous system.

6.1.1. Methodology

" Import Functions "

The import demand curve (M^d) ⁴ is specified to be a function of the relative import prices (P^m) ⁵ and domestic real income (Y^r), algebraically as follows

$$M_t^* = \phi_1 (P_{mt}, P_t, Y_{nt}) \quad 6.1.1.1$$

The relationship in 6.1.1.1 may be written in the following form

$$M_t^* = \phi_2 (P_{mt} / P_t, Y_{nt} / P_t) \quad 6.1.1.2$$

To fit the above relationship statistically, the log-linear form is chosen ⁶ as follows

$$M_t^* = \alpha_{10} (P^m/P)_t^{\alpha_{11}} (Y^r/P)_t^{\alpha_{12}} e^{u_{1t}} \quad 6.1.1.3$$

$$\ln M_t^* = \alpha_{10} + \alpha_{11} \ln P_{mt} + \alpha_{12} \ln Y_{nt} + u_{1t} \quad 6.1.1.4$$

where α_{11} is long-run (LR) price elasticity of import demand, and α_{12} is LR income elasticity of import demand. The signs are expected to be $\alpha_{11} < 0$, $\alpha_{12} > 0$ ⁷.

⁴The unavailability of disaggregated data on the quantity of imports or exports have led empirical studies to use the value of imports or exports as a proxy variable for the regressand (Leamer-Stern 1970, Goldstein-Khan 1985). This study also relied on the second best option by using real value as the dependent variable. An import (export) price was used as a deflator to convert the "nominal value" of imports (exports) into the "real value" as a proxy for the quantity.

⁵Assuming a degree of substitutability between imports and domestic goods.

⁶Although statistically there are some criteria in choosing between functional forms such as the Bera-McAleer test and the Box-Cox test, however, theoretically the problem of choosing functional forms, between linear and non-linear, is common in economic literature; it is often decided in *ad hoc* manner (Leamer-Stern 1970). Since the drawback of linear form is that the price elasticity will diminish as income grows, the constant elasticities or ln form is preferred.

⁷The demand for import is expected to decline if the relative price of imports increases because it will drive domestic residents to switch to

Theoretical and empirical studies show that the most important characteristic of the price elasticities in international trade is that they change through time. Accordingly the distinction between SR and LR elasticities is introduced by the concept of Stock Adjustment (SA) ⁸; the change in imports or exports is related to the difference between the desired demand for imports or exports in period t and actual import or export demand in period $t-1$.

Rewriting equation 6.1.1.4 in the stock adjustment mechanism, it yields

$$m_t^* = \alpha_{10} + \alpha_{11} p_t^m + \alpha_{12} y_t + u_t \quad 6.1.1.5$$

where $m_t^* = \ln M_t^*$, $p_t^m = \ln P_t^m$, and $y_t = \ln Y_t$ (lower case values indicate logarithm to the base e variables).

The gradual adjustment process can be expressed as the adjustment equation as follows

$$m_t - m_{t-1} = \delta_m (m_t^* - m_{t-1}) \quad 6.1.1.6$$

$$\Delta m_t = \delta_m m_t^* - \delta_m m_{t-1} \quad 6.1.1.7$$

where Δm_t is the actual change in import demand, $\delta_m(m_t^* - m_{t-1})$ is the desired change in import demand, and superscript $*$ is the expected variables. The current demand for imports adjust only δ_m to the long run level whereby $0 < \delta_m < 1$. The constant δ_m is to be interpreted as the coefficient of adjustment. It should fall between zero and one; if δ_m is close to zero, the

domestic substitute goods hence reducing the imports demanded. While import demand is expected to rise if domestic real income rises because a rise of the real income implies an increase in the spending power of the economy which leaks in to further imported goods.

⁸A rationale of the use of SA can be made on the basis that the adjustment of actual imports and exports to the desired level is only gradual due to technological, financial and administrative constraints; most imports or exports are related to contracts which may not respond immediately to sudden changes in demand.

adjustment is very slow. Contrastingly rapid adjustment implied if the values of δ_m is close to one.

Substituting 6.1.1.5 into the adjustment equation 6.1.1.7, it yields

$$m_t^d - m_{t-1}^d = \delta_m [\{ \alpha_{10} + \alpha_{11} p_t^m + \alpha_{12} y_t^r + v_{1t} \} - m_{t-1}^d] \quad 6.1.1.8$$

$$m_t^d = \delta_m \alpha_{10} + \delta_m \alpha_{11} p_t^m + \delta_m \alpha_{12} y_t^r + (1 - \delta_m) m_{t-1}^d + \delta_m v_{1t} \quad 6.1.1.9$$

$$m_t^d = \theta_{10} + \theta_{11} p_t^m + \theta_{12} y_t^r + \theta_{13} m_{t-1}^d + v_{10t} \quad 6.1.1.10$$

The equation 6.1.1.10 is a SR import demand function from which both SR and LR price and income elasticities of import demand can be estimated by the technique of Ordinary Least Squares (OLSQ), θ_{11} is SR price elasticity of import demand, θ_{12} is SR income elasticity of import demand, $(1 - \theta_{13})$ is adjustment parameter. Accordingly the LR price elasticity of import demand equals $\theta_{11}(1 - \theta_{13})^{-1}$, and the LR income elasticity of import demand equals $\theta_{12}(1 - \theta_{13})^{-1}$.

Economic theory maintains that the price and quantity of imports and exports are determined by the intersection of the demand and supply curves. Therefore a simultaneous model is theoretically preferable since the simultaneity bias can be accommodated by including supply function to the model, although Leamer-Stern (1970) argues that it remains an open empirical question whether a single equation would give a better prediction than two or more simultaneous equations. Consistent estimates may be obtained for θ 's using the method of Two Stages Least Squares (2SLSQ) ⁹ rather than OLSQ which is biased in this case. Orcutt (1950) argues that the price coefficient is downwardly biased as a result of ignoring the simultaneous relationship. Contrary Klein (1960) asserts that OLSQ is a valid procedure for estimating the model for a small

⁹Two Stage Least Squares (2SLSQ) is chosen rather than Indirect Least Squares (ILSO) since the former can handle overidentified equations.

country since on the world market, a small nation takes prices as given so that the simultaneous bias is not serious. Furthermore the supply of imports faced by a small developing country like Indonesia approaches infinite price elasticity, and under the condition this OLSQ bias disappears.

The world supply of merchandise imports is specified as a function of world commodity price level (P^*) and world real income (Y^{r*}) formally as follows

$$M_{st} = \phi_3 \{ P^*_t, (Y^{r*}/P^*)_t \} \quad 6.1.1.11$$

$$m_{st} = \theta_{20} + \theta_{21} p^*_t + \theta_{22} y^{r*}_t + u_{12t} \quad 6.1.1.12$$

where $m_{st} = \ln M_{st}$, $p^*_t = \ln P^*_t$, and $y^{r*}_t = \ln Y^{r*}_t$

By equating demand for and supply of imports, it yields

$$\begin{aligned} \theta_{10} + \theta_{11} p^{rm}_t + \theta_{12} y^r_t + \theta_{13} m^{d}_{t-1} + u_{10t} = \\ \theta_{20} + \theta_{21} p^*_t + \theta_{22} y^{r*}_t + u_{12t} \end{aligned} \quad 6.1.1.13$$

The first stage of the 2SLSQ is obtained by solving 6.1.1.13. This yields the Reduced Form (RF) function of the relative price of import as follows

$$p^{rm}_t = \Pi_{10} + \Pi_{11} p^*_t + \Pi_{12} y^{r*}_t + \Pi_{13} y^r_t + \Pi_{14} m^{d}_{t-1} + u_{14t} \quad 6.1.1.14$$

The second stage of 2SLSQ yields the Structural Form (SF) equation of the SR demand for import as follows

$$m^s_t = \Pi_{20} + \Pi_{21} p^{rm}_t + \Pi_{22} y^r_t + \Pi_{23} m^{d}_{t-1} + u_{15t} \quad 6.1.1.15$$

where Π_{21} is SR price elasticity of import demand estimated by simultaneous equations (2SLSQ), Π_{22} is SR income elasticity of import demand, Π_{23} is adjustment parameter. Accordingly the LR price elasticity of import demand equals $\Pi_{21}/(1-\Pi_{23})$, and the LR income elasticity of import demand equals $\Pi_{22}/(1-\Pi_{23})$.

" Export Functions "

The world demand for Indonesian exports (X^d) is specified as a function of the relative price of exports (P^x) and real world income (Y^r) formally

$$X_t^{d*} = \Phi_4 (P_t^x, P_t^*, Y_t^{r*}) \quad 6.1.1.16$$

$$X_t^{d*} = \Phi_5 \{ (P^x/P^*)_t, (Y^{r*}/P^*)_t \} \quad 6.1.1.17$$

$$X_t^{d*} = \beta_{10} (P^x/P^*)_t \beta_{11} (Y^{r*}/P^*)_t \beta_{12} e^{v_{17}t} \quad 6.1.1.18$$

$$x_t^{d*} = \beta_{10} + \beta_{11} p_t^{rx} + \beta_{12} y_t^{r*} + v_{17} \quad 6.1.1.19$$

where $x_t^{d*} = \ln X_t^{d*}$, $p_t^{rx} = \ln P_t^{rx}$, $y_t^{r*} = \ln Y_t^{r*}$, β_{11} is LR price elasticity of import demand, and β_{12} is LR income elasticity of import demand. The signs are expected to be $\beta_{11} < 0$, $\beta_{12} > 0$ ¹⁰.

Analogous with the import demand function, formulating 6.1.1.16 in terms of the adjustment equation, it yield

$$x_t^d = \theta_{30} + \theta_{31} p_t^{rx} + \theta_{32} y_t^{r*} + \theta_{33} x_{t-1}^d + v_{23}t \quad 6.1.1.20$$

The equation 1.20 is short-run (SR) world export demand curve, from which long-run (LR) price and income elasticities of world export demand can be estimated. θ_{31} is SR price elasticity of export demand, θ_{32} is SR income elasticity of export demand, $(1-\theta_{43})$ is adjustment parameter. Accordingly the LR price elasticity of export demand equals $\theta_{41}(1-\theta_{43})^{-1}$, and the LR income elasticity of export demand equals $\theta_{42}(1-\theta_{43})^{-1}$.

On the supply side, exports are specified as a function of relative price of exports and capacity utilization of the economy algebraically as

¹⁰The world demand for exports is expected to decline if the relative price of Indonesian exports increases because it will encourage foreign consumers to turn away from Indonesia's goods in the world market. While world demand for exports is expected to rise if world wealth rises.

$$X^s_t = \Phi_6 (P^{rx}_t, Y_t) \quad 6.1.1.21$$

Formulating 6.1.1.21 in terms of the adjustment equation, it yields

$$X^s_t = \theta_{40} + \theta_{41} p^{rx}_t + \theta_{42} y_t + \theta_{43} X^{s}_{t-1} + v_{25t} \quad 6.1.1.22$$

Equating demand for and supply of exports , it yields

$$\begin{aligned} \theta_{30} + \theta_{31} p^{rx}_t + \theta_{32} y^{*}_t + \theta_{33} X^d_{t-1} + v_{23t} = \\ \theta_{40} + \theta_{41} p^{rx}_t + \theta_{42} y_t + \theta_{43} X^s_{t-1} + v_{25t} \end{aligned} \quad 6.1.1.23$$

The first stage of the 2SLSQ is obtained by solving 6.1.1.23, it yields reduced form (RF) of the relative price of exports as follows

$$p^{rx}_t = \Pi_{30} + \Pi_{31} y^{*}_t + \Pi_{32} y_t + \Pi_{33} X^d_{t-1} + v_{27t} \quad 6.1.1.24$$

The second stage of 2SLSQ yields the Structural Form (SF) equation of SR world demand for exports as follows

$$X^d_t = \Pi_{40} + \Pi_{41} p^{rx}_t + \Pi_{42} y^{*}_t + \Pi_{43} X^d_{t-1} + v_{28t} \quad 6.1.1.25$$

where Π_{41} is SR price elasticity of export demand estimated by simultaneous model (2SLSQ), Π_{42} is SR income elasticity of export demand, $(1-\Pi_{43})$ is adjustment parameter. Accordingly the LR price elasticity of export demand equals $\Pi_{41}(1-\Pi_{43})^{-1}$, and the LR income elasticity of export demand equals $\Pi_{42}(1-\Pi_{43})^{-1}$. Analogously, the structural form (SF) of SR world supply for exports (φ_x) can be estimated from 6.1.1.24 as follows

$$X^s_t = \Pi_{50} + \Pi_{51} p^{rx}_t + \Pi_{52} y_t + \Pi_{53} X^s_{t-1} + v_{29t} \quad 6.1.1.26$$

where Π_{51} is SR price elasticity of export supply estimated by simultaneous model, Π_{52} is SR income elasticity of export supply, $(1-\Pi_{53})$ is adjustment parameter. Accordingly the LR

price elasticity of export supply equals $\pi_{51}(1-\pi_{53})^{-1}$, and the LR income elasticity of export supply equals $\pi_{52}(1-\pi_{53})^{-1}$.

Since the disturbance terms (u 's) in the Stock Adjustment (SA) models of imports and exports follow a first order autoregressive process or AR(1), the OLSQ may become inconsistent. Consistent estimates may be achieved via the techniques of Indirect Least Squares (ILSQ) or Limited Information Maximum Likelihood Estimation (LIML). Following the OLSQ estimation, several diagnostic tests will be undertaken to detect any regression problems. The practice of implementing several tests covers the possibility of problems arising in various ways and forms as the tests may not be equally powerful in diagnosing a particular problem. It is likely that if problems were present they would be detected at least by one of the tests. The Chow test will also be employed to test for parameter stability, as well as the dummy variable method to investigate for any structural shifts during the sample period.

" Pass-Through Functions "

"Pass-Through" can be defined as the extent to which a change in the exchange-rate induces a change in domestic prices ¹¹ (Rana-Dowling 1985, Basmani-Oskooee-Malixi 1992, Fenberg-Kaplan 1992). The narrower definition of pass through is the partial derivative of domestic prices with respect to exchange-rate in a model that relates the prices to the exchange-rate ¹².

¹¹ Some economists also define pass-through as the extent to which a change in the exchange rate induces a change in import and export prices (Mann 1986, Baldwin 1988).

¹² Although the theoretical underpinnings of the pass-through literature emphasize microeconomic models of imperfect competition (Baldwin 1988, Dixit 1989), this concept of exchange-rate changes being allowed to pass-through to prices has also been explained in a number of different ways in the macroeconomic literature (Cooper 1971).

Different kinds of analysis can be made in which changes in exchange rates are transmitted to domestic prices. On one side, firstly, domestic producers and wage earners may react less to a small devaluation due to transaction costs in imperfect markets, secondly, the publicity of a large devaluation may cause a greater price responsiveness, thirdly, following a large devaluation, producers may take the opportunity of raising prices of all goods not just those that are affected, and fourthly, incorrect macro policy by the Authorities such as public-wage adjustment and excessive domestic credit following devaluation may lead to high wages; a cost-push spiral. On the other side, if expectations are regressive, exchange rate changes in one direction may lead to expectations of sustained movements in the same direction which could affect the inflation rate ¹³. A "ratchet effect", in which prices are revised upwards following devaluation but not adjusted downwards following revaluation, is also possible. Thus the response of domestic prices to exchange-rate changes depends upon the assumptions about the preferences of economic agents and the way expectations are formed. Therefore the model becomes an empirical one, although this results in *ad hoc* modelling leading to provisional findings that await better "pass-through" theory (Dixit 1989).

The analytical framework for empirical analysis of pass-through in this section is derived by estimating a price equation ¹⁴ similar to Harberger (1963), Bhalla (1980), Saini (1982) as follows

¹³For example, a study by Fenberg-Kaplan (1992) reveals that domestic prices may respond not to actual exchange-rate alone but to anticipated effects as well.

¹⁴The model however has several limitations. It is a partial equilibrium model since pass-through is defined as a partial derivative (direct effect only). A general equilibrium model might take into account indirect effects of exchange rates on the prices through their effects on the other determinants of prices. The full-effects (direct and indirect effects) would depend on the extent of the decline in the Indonesian rupiah affecting to the other determinants of domestic prices. In terms

$$P_t = \phi (M_t, P^m_t, \xi_t) \quad 6.1.1.27$$

The pass-through of a given exchange rate may well change over time. Previous studies suggest that there were significant lags in the response of domestic prices to changes in the exchange-rate (Harberger 1963, Lowinger 1978, Rana-Dowling 1985). Accordingly by formulating equation 6.1.1.27 in terms of Stock Adjustment (SA) lags, it yields ¹⁵

$$P = \pi_{10} + \pi_{11} M_t + \pi_{12} P^m_t + \pi_{13} \xi_t + \pi_{14} P_{t-1} + u_{30t} \quad 6.1.1.28$$

where $\pi_{11} > 0$, $\pi_{12} > 0$, $\pi_{13} > 0$ ¹⁶, P is domestic prices, M is money supply, P^m is import price index, ξ is exchange rate, and t is time. Domestic prices adjust only $(1-\pi_{14})$ to the long run level whereby $0 < (1-\pi_{14}) < 1$. $(1-\pi_{14})$ is the coefficient of adjustment falling between zero and one. If $(1-\pi_{14})$ is close to zero, the adjustment is very slow. Contrary, rapid adjustment implies, the values of $(1-\pi_{14})$ is close to one. The pass-through coefficient or the partial derivative of P with respect to ξ is π_{13} where it is expected that $0 < \pi_{13} < 1$. 1 means that changes in the exchange rate is fully transmitted onto domestic prices, whilst 0 means that it is not transmitted at all.

of equation 6.1.1.28 & 6.1.1.29, the full effects depend on how the exchange-rate variable affected the other explanatory variables in the model which in the second round would affect the domestic prices. This concept is known as "channel-map" in the literature.

¹⁵The alternative model in terms of first-difference is as follows

$$\Delta P = \pi_{20} + \pi_{21} \Delta M_t + \pi_{22} \Delta P^m_t + \pi_{23} \Delta \xi_t + \pi_{24} \Delta P_{t-1} + u_{31t} \quad 6.1.1.29$$

¹⁶It is expected that money supply will exert a positive effect on domestic prices ($\pi_{11} > 0$). If imported inflation is to contribute to domestic inflation, it is expected that $\pi_{12} > 0$. Devaluation in domestic currency which is reflected in an increase in the nominal exchange-rate is expected to exert a positive effect on inflation ($\pi_{13} > 0$).

6.1.2. Empirical Results ¹⁷

The import demand models A3, A4 and A5 pass the diagnostic tests (appendix 6.1A). Unfortunately the Farrar-Glauber test indicates that a multicollinearity problem is common among the models although the degree of multicollinearity is not as severe as those of the export regressions. The multicollinearity problem particularly may come from intercorrelation between the relative price of imports and domestic income variables ($r_{pm,y}=0.644$), and between the relative price of imports and lagged import variables ($r_{pm,m-1}=0.685$).

In 1973, Indonesia's balance of payments gained from the international commodity boom and the price of oil started to climb resulting in a large increase in Indonesia's foreign exchange reserves. This phenomenon is suspected to have changed the stability of the import demand models. In order to examine parameter stability in the models, the Chow test (splitting the data into 1960-1973 and 1973-1988) is applied for the year of 1973 (the boom period). The test indicates that the selected models are fairly stable ($F's_{computed} < 2.87$); there was not any structural change in the import demand between the periods. Among the selected models (the SA models estimated by 2SLSQ), equation A5 is most robust since it also passes the heteroscedasticity test as well as the other tests. Additionally the simultaneous equation of A5 or 6.1.2.1 is theoretically preferable, since it overcomes the bias as suggested by Orcutt (1950). This equation is

$$m_t^d = -1.417 - 0.065 p_t^{im} + 0.217 y_t^r + 0.894 m_{t-1}^d \quad 6.1.2.1$$

t (-1.32) (-2.68)* (2.52) (16.49)*

Adj. $R^2=0.894$ $\sigma=0.215$ $L_1=3.08$ $L_2=2.34$ $L_3=2.38$ $L_4=3.01$

where σ stands for standard error of the regression, L_i for Lagrangian Multiplier tests for higher degree of serial

¹⁷ Unless otherwise indicated, this study uses 5% percent significance level. * (star) means the figure is significant at 1%.

correlation, and subscript i for the degree whereby $i = 1$ to 4. Equation 6.1.2.1 is the Short-Run Stock Adjustment (SR-SA) model of the import demand function. By eliminating the lagged dependent variable, the LR model of import demand is

$$m^d_t = -13.369 - 0.613 p^{rm}_t + 2.047 y^d_t \quad 6.1.2.2$$

The above equations indicate that domestic real income and import price appears to be significant at the 0.05 level in explaining the movement of import demand during the period of 1960 to 1988.

On the export demand side, there have been structural shifts in the export models particularly during the years 1968 to 1973 (appendix 6.1B). The Chow test indicates that during this period the models of B5 and B6 were not stable (marked by significant F tests). This phenomenon explains why most export demand equations do not give the expected results. The year 1968 was regarded as the period of transition from *Ode Baru* to *Orde Lama* after a revolution in 1965-1966. This phase was characterized by the restoration of the Indonesian economy after a huge deficit and chaos, whereas 1973 was the oil boom period when Indonesia experienced a time of rapid economic growth and build-up in foreign exchange reserves due to increases in the oil price and production. Hence to remove those disturbance effects from the model, the dummy-variable method was applied¹⁸. The dummy-variable model also passes

¹⁸Since the study does not have large number of observations, the Dummy-variable will be applied only to the Stock Adjustment model to exclude the model for disturbances in the year of 1968 to 1973 as follows

$$x^d_t = \tau_{10} + \tau_{11} Dc + \tau_{20} p^{FX} + \tau_{21} Dprx$$

$$+ \tau_{30} y^{*F} + \tau_{31} Dy + \tau_{40} x^d_{t-1} + \tau_{41} Dxd-1$$

Dc = [0 for the period of disturbance, 1 for the stable period]

$Dprx$ = [0 for the period of disturbance, p^{FX} for the stable period]

Dy^* = [0 for the period of disturbance, y^{*F} for the stable period]

$Dxd-1$ = [0 for the period of disturbance, x^d_{t-1} for the stable period]

To examine the interaction of slope-intercepts effects, F tests are applied to remove insignificant dummy variables. The final result indicates that

favourably the diagnostic tests (appendix 6.1B) except for the normality-of-residual test. However, since the other models (B5 & B6) do not pass the Lagrangian Multiplier test for autocorrelation, and the Harvey test for heteroscedasticity which causes a "worst" bias among the other regression problems (Belsley-Kuh-Welsh 1980), the dummy-variable model is considered therefore to be the dominant equation for export demand. As with the import model, the multicollinearity problem is common, especially regarding the relationship between the price of export and the lag of export price ($r_{prx, prx-1}=0.875$), and foreign income and the lag of foreign income ($r_{y^*, y^*-1}=0.798$).

The dummy-variable model for exports is as follows

$$\begin{aligned}
 x_t^d = & -13.313 + 14.322 D_c - 0.887 p^{rx} + 0.790 D_p \\
 (t) \quad & (-2.97) \quad (3.47)^* \quad (-3.39)^* \quad (2.84)^* \\
 & + 0.929 y^{*r} - 0.859 D_y + 0.779 x_{t-1}^d \\
 (t) \quad & (3.75)^* \quad (-3.44)^* \quad (4.61)^*
 \end{aligned}
 \tag{6.1.2.3}$$

Adj.R² = 0.855 σ = 0.095 L₁ = 0.67 L₂ = 0.69 L₃ = 0.96 L₄ = 2.57

Equation 6.1.2.3 is the dummy variable models of the export demand function for the whole period 1960-1988. From 6.1.2.3 the SR-SA model can be deduced as

$$x_t^d = 1.009 - 0.097 p^{rx} + 0.070 y^{*r} + 0.779 x_{t-1}^d \tag{6.1.2.4}$$

Equation 6.1.2.4 is the SR dummy-variable model of the export demand function. By eliminating the lagged dependent variable, the LR dummy-variable model of the export demand can be derived as follows

$$x_t^d = 4.566 - 0.439 p^{rx} + 0.317 y^{*r} \tag{6.1.2.5}$$

during the disturbance period, the intercepts and the coefficients of p^{rx} and y^{*r} change while x_{t-1}^d does not. Accordingly D_y is removed which yields the dummy-variable model as follows

$$x_t^d = \tau_{10} + \tau_{11} D_c + \tau_{20} p^{rx} + \tau_{21} D_{prx} + \tau_{30} y^{*r} + \tau_{31} D_y + \tau_{40} x_{t-1}^d$$

World income and relative export price appear to be significant, even at 1%, in explaining the movement of export demand in the economy. From equation 6.1.2.1 to 6.1.2.5, price elasticities of demand for imports (η_m) and exports (η_x) for examining the necessary condition of Marshall-Lerner can be estimated. Table 6.1.2.1 shows that the SR price elasticity of import demand is quite low at -0.065 which goes to -0.613 for the LR estimate. Whilst the SR income elasticity of imports is 0.217 and the corresponding LR of 2.047. The SR and LR income elasticity of import for Indonesia is in line with the previous studies in other countries (table 6.1.2.2). The price elasticity of import demand turns to be very inelastic in the SR (-0.065), and it is significantly different from zero. This result is credible since Indonesia imports mostly necessities and industrial goods needed for its successive *Pembangunan Lima Tahun*. The quantity imported therefore is likely to be insensitive to price changes. Additionally Indonesia does not yet have many well-developed import competing industries; in the SR it may be difficult to react to price changes ($\eta_m^{SR} = -0.065$) by reallocating factor of productions. This finding seems to confirm the commonly expressed view that developing countries have a price inelastic demand for imports (Goldstein-Khan 1985). Devaluation therefore will increase the domestic prices of the importable goods in the SR but will not induce expenditure switching !

Table 6.1.2.1
The Necessary Condition of Marshall-Lerner (SR&LR)

Period	Import	Export	$\eta_m + \eta_x$	Marshall-Lerner
Short Run	-0.065	-0.097	-0.162	Not Satisfied
Long Run	-0.613	-0.439	-1.052	Satisfied

The SR price elasticity of export demand is quite low at -0.097 with the corresponding LR of -0.439, whereas the SR world income elasticity of export is 0.070 and the LR is 0.317. Those low income and price elasticity estimates are not in

accordance with the previous empirical studies in industrial countries (table 6.1.2.2). However, these price estimates is in conformity with previous studies in developing economies (Khan 1974); developing countries like Indonesia as primary commodities exporters expect to face an inelastic demand schedule hence exports demanded is not sensitive to price changes.

Table 6.1.2.2
Comparison with Other Studies¹⁹

Elasticity	Export	Other Studies	Import	Other Studies
SR Price	-0.097	-0.32 to -1.66	-0.065	-0.50 to -1.84
SR Income	0.070	0.38 to 0.93	0.217	0.153 to 1.37
SR Price	-0.439	-1.33 to -2.32	-0.613	-0.97 to -2.90
SR Income	0.317	0.91 to 4.22	2.047	0.84 to 4.03

Compared to the income elasticities of imports ($\alpha_{m}^{SR}=0.217$, $\alpha_{m}^{LR}=2.047$), there is much less variation in the income elasticity of exports ($\alpha_{x}^{SR}=0.070$, $\alpha_{x}^{LR}=0.317$). The income elasticity of demand for Indonesia's exports is only 20 per cent of the income elasticity of imports, that is, income elasticity of import demand is considerably more elastic than that of export demand. This implies that Indonesia has a relatively high propensity to imports in contrast to the world demand for Indonesia's exports. These high income elasticity figures also imply that as income increases, imports will be an increasing share of GNP. On the other hand, the income elasticities of world demand for Indonesia's exports is found to be very low, they appear to be much smaller than those of the previous studies (table 6.1.2.2) implying that Indonesian exports are not

¹⁹Uniform inter-elasticity comparison is not possible since some studies report SR figures whereas some studies do not, so they are selected based on the availability of the information from Balassa (1979), Beenstock-Minford (1976), Deppler-Ripley (1978), Goldstein-Khan (1978), Hickman-Lau (1973), Houthakker-Magee (1969), Junz-Rhomberg (1973), Khan (1974), and Taplin (1973).

shown to be sensitive to the world level of economic activity. This unresponsiveness of world demand implies that Indonesia's merchandise exports might not be able to compete in the world market as an indication of Indonesia's weak trade performance.

SR price and income elasticities are lower than the LR ones. The difference between SR and LR elasticities is considerably large with a high adjustment process, the adjustment coefficient of the export function is 0.779 whereas the import is 0.894. The adjustments are almost instantaneous between SR and LR demand for imports and exports with the coefficients of adjustments being almost unity. About 80% between desired and actual export demanded is carried out in a year, whereas in the import side about 90% is captured in a year. The necessary condition of the Marshall-Lerner theory is not satisfied in the SR; the sum of the price elasticities for import and export demand is less than one; in the LR the necessary condition more or less will be fulfilled. Despite the fact that the condition is fulfilled in the long run, the price elasticities of import and export demand are still relatively low; they are not substantially greater than one ($\eta_m + \eta_x = -1.052$). Overall the estimates reveal that there would seem to be a basis for this type of "elasticity pessimism". This finding contradicts Rosendale view's (1981) that there is no ground for "balance-of-payments pessimism" in Indonesia.

It appears that the results of import demand functions (A3, A4, A5) obtained by different estimation techniques such as OLSQ, 2SLSQ and LIML yields almost similar coefficients (appendix B). The inclusion of supply factors in the import function does not seem to make much difference in the magnitude and significance of the coefficients. These findings are more in line with Klein's argument (1960) that OLSQ results do not differ a great deal from those of 2SLSQ for a small country case. However, in the export side, the parameter coefficients differ

considerably among different estimation techniques. Most of the OLSQ estimates are lower than those of 2SLSQ (appendix B) indicating the existence of a simultaneity relationship in the export system as argued by Orcutt (1950) that OLSQ produces lower elasticity estimates which have biased toward zero.

On the supply side, the SR-SA export supply equation for 1960-1988 is as follows

$$x_t^s = 4.640 + 0.181 p^{rx} + 0.082 y^r + 0.442 x_{t-1}^s \quad 6.1.2.6$$

t (2.02) (2.15) (1.86) (2.00)

Adj.R²=0.71 σ=0.13 F=23.19 Sargan test=1.66

Eliminating the lagged dependent variable, the LR export supply equation can be derived as follows

$$x_t^s = 8.315 + 0.324 p^{rx} + 0.147 y^r \quad 6.1.2.7$$

The results show that domestic capacity utilization and relative export price appear to be significant in explaining the movement of export supply in the economy. The Sargan test as in other statistics show that the export supply equation estimated by 2SLSQ is correctly specified. The stability test indicates that the export supply equations are fairly stable (CUSUMSQ<0.6644). The adjustment lags (0.558) imply that, first, SR elasticities for export supply are essentially smaller than the corresponding LR, second, about 56% of the discrepancy between the desired and actual export supply is eliminated in a year. Compared to the adjustments of import demand (90%), the adjustment of export supply is considerably lower. This difference of the adjustment process explains why Indonesia has experienced trade problems since the last decade.

The estimates of the export supply relationship yield useful information; the price elasticity of export supply is positive and significant implying a positively sloped supply function for Indonesia's export, compared to Japan which has infinitely elastic export supply (Goldstein-Khan 1978). It appears that in

both SR and LR, the quantity of exports supplied reacted slowly to the changes in the domestic capacity utilization indicating the country's structural problem unabling it to switch resources into production. The income elasticity of export supply is also lower than those of other developing countries (Goldstein-Khan 1985) impiying that Indonesia's exports also suffer from unusually a low income elasticity. The alternative export supply functions estimated by the single estimation methods (LIML and CO) are basicaly similiar with those of 6.1.2.6 and 6.1.2.7 (appendix 6.1C).

Table 6.1.2.3
SR and LR Elasticities of Import Demand and Export Supply
(Comparison with the Previous Study on Indonesia)

Elasticity	Export	Kincaid (1984)	Import	Kincaid (1984)
SR Price	0.181	0.61	-0.065	-0.20
SR Income	0.082	0.53	0.217	0.83
LR Price	0.324	6.00	-0.613	-0.30
LR Income	0.147	5.19	2.047	1.30

Table 6.1.2.3 indicates *inter alia* SR and LR price elasticities of export supply are considerably smaller than those obtained by Kincaid (1984), as are the income elasticities of exports. Surprisingly, the sufficient condition of Marshall-Lerner (the sum of price elasticities of import demand and export supply being greater than zero) is satisfied in the SR but not in the LR (table 6.1.2.4). It implies that immediately after devaluation the trade balance ameliorated but in the long run it deteriorated ! The phenomena is similiar to the study by Turnovsky (1968) indicating that there is a lack of J-curve effect in the context of the sufficient condition for devaluation to improve the trade balance. These low price elasticities of export supply are indicative of structural rigidity in the economy such as inability to move resources quickly for production; supply inability to respond in switching world demand. Contrastingly Kincaid shows that the sufficient

condition of Marshall-Lerner is satisfied. The difference may be due to the nature of the data used. Whilst this study uses annual data (1960-1988), Kincaid employs quarterly adjusted data (1971-1981) and investigates the J-curve phenomena in a shorter-time frame (during the 1973 and 1978 devaluations). It is plausible that the sufficient condition of Marshall-Lerner is satisfied in the SR as Kincaid shows, however, in the LR (during the 1968, 1973, 1978, 1983, 1985 and 1987 devaluations) this condition would be perverse.

Table 6.1.2.4
The Sufficient Condition of Marshall-Lerner (SR & LR)

Period	Import	Export	$\eta_m + \varphi_x$	Marshall-Lerner
Short Run	-0.065	0.181	0.116	Satisfied
Long Run	-0.613	0.324	-0.289	Not Satisfied

In estimating the above price elasticities of imports and exports, it is assumed that domestic price level were constant (no "pass-through" effect). To examine this assumption (the robustness of the price elasticities of exports and imports), a "pass-through" function will be examined. The pass-through function is as follows ²⁰

$$P_t = -1.960 + 0.100 \xi_t + 0.070 P^m_t + 0.002 M_t + 0.763 P_{t-1} \quad 6.1.2.8a$$

(-2.27) (2.76)* (2.53) (3.86)* (11.48)*

$$\text{Adj.}R^2 = 0.99 \quad \text{DW}(h) = -0.20 \quad \sigma = 1.61 \quad F = 4454.6 \quad \text{ML} = -52.19$$

The estimated SR pass-through equation reveals that independent variables (exchange rate, import price, money supply and lagged domestic price) are significant in explaining

²⁰The alternative SR pass-through equation is

$$\Delta P_t = 0.555 + 0.143 \Delta \xi_t + 0.101 \Delta P^m_t + 0.020 \Delta M_t + 0.475 \Delta P_{t-1} \quad 6.1.2.9a$$

(0.83) (2.74)* (2.70)* (2.77)* (3.71)*

$$\text{Adj.}R^2 = 0.99 \quad \text{DW}(h) = -0.10 \quad \sigma = 2.10 \quad F = 14.77 \quad \text{ML} = -57.75$$

whilst the corresponding LR estimate is

$$\Delta P_t = 1.057 + 0.272 \Delta \xi_t + 0.192 \Delta P^m_t + 0.040 \Delta M_t \quad 6.1.2.9b$$

domestic price responses during 1960-1988. SR pass-through coefficient is 0.100. The coefficient of adjustment is found to be 0.237 implying that about 24 percent of the discrepancy between the expected and actual changes in domestic prices is carried out in a year. The statistical performances of the model are adequate as are the estimated DW statistics ($h=-0.20$) indicating that there is no serial correlation in the model which is supported by the Lagrangian Multiplier test for the fourth degree ($L_1=0.02$, $L_2=-2.41$, $L_3=-0.05$, $L_4=-2.12$).

From 6.1.2.8a, LR pass-through equation can be obtained as

$$P_t = 8.270 + 0.422 \xi_t + 0.295 P_{mt} + 0.008 M_{t-1} \tag{6.1.2.8b}$$

The result suggests that the LR effect of a 10 percent devaluation is to result in higher domestic prices by 4.2 percent suggesting almost a half of full pass-through ! Table 6.1.2.5 below summarizes some estimates of domestic price responses to a hypothetical 10% change in the explanatory variables.

Table 6.1.2.5
Estimates of the Partial Effect of a 10 Percent Change
of the Independent Variables into the Dependent Variable

Equation	Explanatory Variable	Short-Run Effect	Long-Run Effect	% Adjustment in a year
2.8	ξ_t	1.00%	4.22%	24 %
	P_m	0.70%	3.00%	
	M_t	0.02%	0.08%	
2.9	$\Delta \xi_t$	1.43%	2.72%	53%
	ΔP_m	1.01%	2.00%	
	ΔM_t	0.02%	0.04%	

Exchange rate has a significantly positive effect on the domestic price level; almost a half of any 10% devaluation will be transmitted to higher domestic price level in the long run. Previous estimates of the extent of exchange rate pass-through

for developing countries suggest that the pass through effect was in the range of 2 to 4% ²¹. The import price also carries a positive and significant effect at 5% level. The significance of the import price coefficient does not contradict the view of the "imported inflation" hypothesis in developing countries. This imported inflation can sharply diminish the "real" exchange rate changes that results from "nominal" exchange rate changes thereby simply reducing the power of the expenditure switching effects of such devaluations. The domestic price effect of import price is significant in Indonesia due to several factors such as the substitutability between imported goods and domestic goods in consumption and the big share of imports in total output. Taken together, the total effect (direct and indirect effects) of exchange rate and import price would induce higher domestic price thereby aggravating inflationary effect in the economy. This increase in the domestic price would significantly affect the relative price of imports and exports; thus having strong implications for the interpretation of the price elasticities figure estimated previously. In consequence, this will lessen or diminish estimated price elasticities of imports and exports; the "true" price elasticities figures would be larger than those presented. Intuitively, the Marshall-Lerner condition for devaluation to improve the trade balance is more difficult to achieve. To estimate if and when any structural breaks may have occurred, a CUSUMSQ test was performed on the models. The CUSUMSQ test suggests that there were no structural breaks in all equations; the pass-through relationship has not changed over time.

²¹A comprehensive survey can be found in Bhalla (1981), Goldstein-Khan (1985) and Basmani-Oskooee-Malixi (1992).

From the results, several important findings emerge as follows

- This study reveals that a disequilibrium model may be justified for import, export and pass-through models in the economy. The coefficients on the lagged dependent variables are significantly different from zero in all cases, implying a degree of dynamic adjustment. The parameter coefficients are more elastic in the LR compared with the SR ones. This finding is consistent with earlier studies about the existence of time lag in the international trade. The explanatory variables of the import, export and pass-through models perform adequately whereby the coefficients are statistically significant, and the sign in each case appears to be in the right direction.

- The necessary condition of Marshall-Lerner is not satisfied in the SR, it is fulfilled in the LR but only minimally ! However the necessary condition is not sufficient for devaluation to improve the trade balance. In fact the sufficient condition of Marshall-Lerner shows that in the SR, the trade balance ameliorates but deteriorates in the LR, thus a reverse "J-curve" effect is suggested. These necessary and sufficient conditions might have been satisfied if pass through effect are not significant. This significance of the pass through coefficient reveals that it is difficult to sustain domestic price changes due to devaluation. Hence inflationary effects counteract the price advantages that the devaluation is designed to give Indonesia's product in the foreign and domestic market !

- The above estimates may indicate that the relative prices do not play an important role in the Indonesian merchandise trade balance mechanism. It seems that price elasticities of imports and exports tend to be much smaller than would have been generally expected. On the one hand, because of the low price elasticity of import demand, the quantity of goods imported is reduced only slightly causing the demand curve for foreign exchange to be inelastic. On the other hand, because of the low

price elasticity of export demand, the quantity of goods exported is improved only slightly. Devaluation therefore fails to eliminate the excess demand for foreign currency.

- The world demand for Indonesia's export is inelastic abroad. Consequently variation in the level of aggregate demand in foreign countries does not have much effect on the export volume. The unresponsiveness of world aggregate demand is indicative of Indonesia's weak trade performance. Devaluation therefore increases rather than eliminates the existing excess demand for foreign exchanges because at lower prices after devaluation only a small number of additional merchandise is exported, at the same time the quantity of goods imported is reduced only slightly. Overall taken as a whole, these results imply that the Indonesian trade balance will tend *ceteris paribus* to worsen over time.

- The income elasticity of demand for Indonesia's imports measures the proportional change in demand for imports with respect to a proportional change in Indonesia's income, whilst the income elasticity of demand for Indonesia's export measures the proportional change in the demand for Indonesia's exports with respect to a proportional change in other countries' incomes. Since the income elasticity of import demand is significantly larger than those for exports, Indonesia cannot grow faster than other countries without balance of payments deteriorating (a low propensity of other countries to buy Indonesia's exports and a high propensity in Indonesia to import foreign goods particularly manufacturing). The disparities in income elasticities of import and export demand (income elasticity of export is three times the import elasticity in the SR and nearly seven times in the LR) reveal the evidence of the "Houthakker-Magee" effect indicating that the main problem of Indonesia's trade balance requires real economic policies of a structural nature in the economy such as secondary outward-looking policies (promoting manufactured

exports, switching the export structure from primary products towards manufacturing products). Policies designed to work straight on manufactured exports, however, will be more efficient such as concentrating on the type of goods exported within the product range like quality, reliability, maintenance and marketing.

- Changes in the money supply, real exchange rate and import price are contributing factors to changes in Indonesia's domestic price level thereby increasing the rate of inflation. The transmission of exchange rate and import price variables onto domestic price is significant, devaluation induced higher domestic price. The phenomena might be due to the fact that *inter alia*, firstly, the publicity of large devaluations caused a greater price responsiveness. Secondly, following a large devaluation, domestic producers may take the opportunity of raising the price of all goods not just those that are affected by devaluation. Thirdly, incorrect macroeconomic policies by Suharto's Cabinet such as public wage adjustment and excessive domestic credit following devaluations might aggravate the rate of inflation. Accordingly the benefit of the price effects induced by the devaluation would be negated by inflationary effect of the devaluation.

- In the light of these results, Indonesia's weak trade balance is progressively seen as a structural problem related to the capacity to produce and to the characteristics of goods exported which are not answerable singularly to devaluation; the payments difficulties in fact originate from the supply side and non-price factors as the evidence of structural rigidity. The phenomena may explain why Indonesia has been hampered with balance of payments problems since the last decade whereby Suharto's Cabinet has adopted a devaluation policy for correcting deficits in 1968, 1973, 1978, 1983, 1985 and 1987. An improvement in the competitiveness via the devaluations cannot cure the balance of payments disequilibrium

permanently to counteract the adverse structural factor in the economy. Suharto's devaluations therefore are not only inflationary but also ineffective in correcting the balance of payments in the long run due to the low trade elasticities and structural rigidity in the economy.

APPENDIX 6.1A

All variables are in natural logarithm t-values are in parenthesis and -- is the information not available

Table 1 : Regressand : m_t^d

No	Regressors	const.	p^{rm}_t	p^{rm}_{t-1}	v^r_t	v^r_{t-1}	m^d_{t-1}	Adj.R ²	σ	DW (d)
A1	OLSQ Static Model	7.922 (2.36)	-0.238 (-3.79)		0.113 (0.38)			0.421	0.617	0.159
A2	2SLSQ Static Model	4.762 (1.27)	-0.332 (-4.36)		0.402 (1.21)			0.367	0.645	0.246
A3	OLSQ Stock Adjustment Model	-1.360 (-1.29)	-0.060 (-3.00)		0.206 (2.54)		0.900 (17.6)	0.957	0.169	L ₁ 3.69 L ₂ 2.29 L ₃ 2.31 L ₄ 3.47
A4	LIML Stock Adjustment Model	-1.240 (-0.02)	-0.056 (-0.06)		0.191 (0.05)		0.906 (0.35)	0.957	0.156	L ₁ 3.72 L ₂ 2.35 L ₃ 2.38 L ₄ 3.54
A5	2SLSQ Stock Adjustment Model	-1.417 (-1.32)	-0.065 (-2.68)		0.217 (2.52)		0.894 (16.4)	0.956	0.168	L ₁ 3.08 L ₂ 2.34 L ₃ 2.38 L ₄ 3.01
A6	OLSQ Correction forAR(1) Model	-1.610 (-1.48)	0.136 (1.51)	-0.195 (-2.33)	0.234 (2.70)	0.032 (0.36)	0.846 (16.1)	0.963	0.157	L ₁ 2.40 L ₂ 4.24 L ₃ 13.14 L ₄ 15.96
A7	LIML Correction forAR(1) Model	-1.309 (0.02)	-0.140 (0.03)	-0.195 (0.05)	0.224 (0.05)	0.024 (0.00)	0.845 (0.02)	0.962	—	L ₁ 2.31 L ₂ 4.40 L ₃ 13.25 L ₄ 15.87
A8	2SLSQ Correction forAR(1) Model	-2.088 (-1.38)	-0.191 (-0.42)	0.100 (0.25)	0.156 (0.97)	0.113 (0.73)	0.901 (9.05)	—	0.198	L ₁ 9.21 L ₂ 7.99 L ₃ 8.14 L ₄ 12.58

Table 2
Diagnostic Tests for the Selected Import Models

Model	A3	A4	A5	Critical Value
Autocorrelation	L1=3.72	L1=3.69	L1=3.08	F=3.84
Lagrangian Multiplier (L) test	L2=2.35	L2=2.29	L2=2.34	F=5.99
	L3=2.38	L3=2.31	L3=2.38	F=7.82
	L4=3.47	L4=3.47	L4=3.01	F=9.49
Heteroscedasticity				
Glejser (G) test ²²	G=0.37	G=0.29	G=0.20	$\chi^2=3.84$
B test ²³	B=12.07	B=11.60	B=4.37	$\chi^2=7.81$
Harvey (H) test ²⁴	H=11.73	H=8.59	H=3.51	$\chi^2=7.81$
Normality				
GoodnessFit (GF) test	GF=7.37	GF=6.11	GF=6.48	$\chi^2=9.49$
Parameter Stability				
Chow (C) test	C13,15=1.15		C13,15=2.70	F=2.87
Specification Error	R ² =0.28	R ² =0.39	R ³ =0.06	F=4.28
Ramsey-Reset (R) test	R ³ =0.61	R ³ =0.62	R ³ =0.47	F=3.44
	R ⁴ =0.62	R ⁴ =0.64	R ⁴ =1.17	F=3.07
Multicollinearity				
Farrar-Glauber (FG) test	FG=28.93	FG=26.50	FG=32.67	$\chi^2=7.81$

Table 3
Diagnostics for the Selected Import Models ²⁵

Problem	A5	A6	A9
Autocorrelation	✓	✓	✓
Heteroscedasticity	×	×	✓
Normality	✓	✓	✓
Stability	✓	n.a	✓
Specification Error	✓	✓	✓
Multicollinearity	×	×	×

²² $e^2 = \phi 1$ (Predicted Regressand).

²³ $e^2 = \phi 2$ (Regressors).

²⁴ $\ln e^2 = \phi 3$ (Regressors).

²⁵✓ means the model passes the test. × means the model does not pass.

APPENDIX 6.1B

Table 1: Regressand : x^d_t

No	Regressors	const.	p^{rx}_t	p^{rx}_{t-1}	y^{r*}_t	y^{r*}_{t-1}	x^d_{t-1}	Adj.R ²	σ	DW (d)
B1	OLSQ Static Model	8.622 (13.77)	0.118 (1.69)		0.078 (2.10)			0.646	0.149	0.785
B2	2SLSQ Static Model	7.506 (6.48)	-0.076 (-1.03)		0.135 (1.90)			–	0.111	1.654
B3	OLSQ Stock Adjustment Model	-1.505 (0.86)	-0.050 (-0.75)		0.054 (1.85)		0.755 (4.24)	0.789	0.115	L ₁ 2.22 L ₂ 2.23 L ₃ 2.17 L ₄ 2.65
B4	LIML Stock Adjustment Model	1.544 (0.01)	0.051 (0.01)		0.055 (0.02)		0.750 (0.05)	0.789	0.107	L ₁ 2.23 L ₂ 2.30 L ₃ 2.21 L ₄ 2.68
B5	2SLSQ Stock Adjustment Model	6.423 (50.42)	-0.220 (-3.82)		0.131 (1.82)		0.107 (7.63)	–	0.109	L ₁ 3.23 L ₂ 2.99 L ₃ 4.91 L ₄ 5.10
B6	OLSQ Correction forAR(1) Model	1.777 (0.93)	-0.381 (-2.78)	0.308 (2.86)	0.045 (0.66)	0.030 (0.41)	0.693 (3.53)	0.844	0.098	L ₁ 4.28 L ₂ 4.68 L ₃ 6.21 L ₄ 6.77
B7	LIML Correction forAR(1) Model	0.157 (0.01)	-0.400 (0.03)	-0.317 (0.03)	0.049 (0.01)	0.012 (0.00)	0.882 (0.06)	0.826	0.093	L ₁ 4.27 L ₂ 4.69 L ₃ 6.29 L ₄ 6.84
B8	2SLSQ Correction forAR(1) Model	23.991 (0.42)	4.44 (-0.48)	-3.32 (-0.48)	0.898 (0.55)	-1.227 (-0.53)	-0.0889 (-0.19)	–	0.088	L ₁ 26.01 L ₂ 26.45 L ₃ 26.49 L ₄ 26.50
B9	OLSQ Dummy 26 Var.Model	1.009	-0.097		0.070		0.779	–	–	–

²⁶The original equation of the Dummy-variable is presented in the text.

Table 2
Diagnostic Tests for the Selected Export Models

Model	B5	B6	B9	Critical Value
Autocorrelation	L1=4.20	L1=4.28	L1=0.67	F=3.84
Lagrangian Multiplier (L) test	L2=4.17	L2=4.68	L2=0.69	F=5.99
	L3=4.87	L3=6.21	L3=0.96	F=7.82
	L4=4.93	L4=6.77	L4=2.57	F=9.49
Heteroscedasticity				
Glejser (G) test	G=0.11<3.84 ²⁷	G=0.10<3.84	G=0.15<3.84	
B test	B=0.20<7.81	B=10.89<11.07	B=6.10<12.59	
Harvey (H) test	H=9.97>7.81	H=7.12<11.07	H=8.73<12.59	
Normality	GF=5.89	GF=5.77	GF=4.18	
GoodnessFit (GF) test	< χ^2 =9.49	< χ^2 =5.99	> χ^2 =3.84	
ParameterStability	C8.20=2.89	C8.20=0.84		F=2.87
Chow (C) test	C10.18=1.87	C10.18=6.72		F=2.87
	C13.15=1.37	C13.15=6.36		F=2.87
Specification Error	R ² =0.38	R ² =0.28	R ³ =0.20	F=4.27
	R ³ =0.25	R ³ =0.25	R ³ =0.12	F=4.35
Ramsey-Reset (R) test	R ⁴ =0.16	R ⁴ =0.18	R ⁴ =0.13	F=3.13
Multicollinearity	FG=166.94	FG=46.48	FG=30.75	
Farar-Glauber (FG) test	> χ^2 =7.81	> χ^2 =18.31	> χ^2 =18.31	

Table 3
Diagnostic Results for the Selected Export Models

Problem	B5	B6	B9
Autocorrelation	x	x	✓
Heteroscedasticity	x	✓	✓
Normality	✓	✓	x
Stability	x	x	✓
Specification Error	✓	✓	✓
Multicollinearity	x	x	x

²⁷The figures on the right of the inequality sign is the critical value of the distribution.

APPENDIX 6.1C

$x_t^s = 2.058 + 0.115 p^{rx} + 0.241 y^r + 0.518 x_{t-1}^s$ $t \quad (0.95) \quad (1.86) \quad (2.46) \quad (1.94)$ Adj.R ² =0.62 σ=0.12 F=4.73 DW=2.07	LIML, SR
$x_t^s = 4.270 + 0.238 p^{rx} + 0.500 y^r$	LIML, LR

$x_t^s = 2.039 + 0.116 p^{rx} + 0.241 y^r + 0.520 x_{t-1}^s$ $t \quad (0.94) \quad (1.96) \quad (2.47) \quad (1.94)$ Adj.R ² =0.61 σ=0.12 F=4.73 DW=2.07	CO, SR
$x_t^s = 4.248 + 0.242 p^{rx} + 0.502 y^r$	CO, LR

6.2.THE ABSORPTION APPROACH TO THE BALANCE OF PAYMENTS (THE ABSORPTION MODEL)

The purpose of the present section is to examine the applicability of the Absorption Approach to the Balance of Payments (AABP) hypothesis to the Indonesian economy for the period 1960-1988 (using annual data).

The Elasticities Approach to the Balance of Payments (EABP) maintains that a devaluation will improve a nation's trade balance if there is sufficient elasticity in the demand and supply schedule. The proponents of the Elasticities Approach to the Balance of Payments, Robinson (1947) and Metzler (1948), describe this condition for an improvement in the nation's trade balance in terms of price elasticities of imports and exports. This proposition is well known in the literature as the Marshall-Lerner condition (see chapter 3.1). On the other hand as outlined in chapter 3.2, the Absorption Approach to the Balance of Payments (AABP) theory argues that the devaluation will only be succesful if it causes the relative gap between domestic output and dometic absorption to be widen.

Letting the signs of TB, Y, C, I, G, X, M, and A stand for trade balance, output, consumption, investment, government expenditure, export, import, and absorption, the balance of trade (TB) may be derived as follows

$$TB = Y - A$$

6.2.1

It implies that a devaluation may improve the trade balance component of the balance of payments only through relative

enlargement in output (Y) or relative reduction in absorption (A where $A=C+I+GE$)¹. In contrast with the EABP hypothesis², the AABP proposition models trade balance, income and spending equations by a macroeconomic approach; it emphasizes the interaction between national income and total absorption in the economy in determining a nation's balance of payments.

This section 6.2 is organized into two parts. Part 6.2.1 discusses methodology to examine the AABP hypothesis, particularly the functional forms used. Part 6.2.2 presents empirical results and conclusions. Complete notations are presented back in chapter 5 while different estimation methods will be presented in appendix 6.2A to 6.2E.

6.2.1. Methodology

The AABP is pioneered by Alexander (1951, 1952) and Miles (1978) stating that the trade balance (TB) component of the balance of payments can be viewed as the difference between national income (Y) and absorption (A), or formally as follows

$$TB_t = Y_t - A_t \quad 6.2.1.1$$

$$A_t = C_t + I_t + GE_t \quad 6.2.1.2$$

Writing 6.2.1.1 in terms of change, it yields

¹However, it is the relative movement of income and absorption that is relevant in this case, not the absolute movement (see more on page 6-2-2 about the direct and indirect effects).

²Although the Elasticities Approach (EABP) analyzes the trade balance component of the balance of payments (the left-hand side of equation 6.2.1.1) by employing a microeconomic approach on the markets for exports and imports, however, the EABP does not say anything about the right hand side of the equation; it does not explain anything about whether a devaluation will increase A or decrease Y but the AABP does.

$$dTb_t = dY_t - dA_t$$

6.2.1.3

it follows from 6.2.1.1 that for a devaluation to improve the balance of trade, it must either increase national income, decrease absorption or ideally both. Since the change in absorption (dA_t) can be decomposed into two portions, i.e, the indirect effect ($dA_t^i = \alpha_a dY_t$) which comes about as a result of any change in Y_t via Keynesian induced expenditure effect, and the direct effect on absorption (dA_t^d) which includes all effects besides the result of changes in income, hence the trade balance (6.2.1.4) and the spending (6.2.1.5a and 6.2.1.5b) equations of the AABP hypothesis can be derived as follows

$$dTb_t = (1-\alpha_a) dY_t - dA_t^d \quad 6.2.1.4$$

$$dA_t = dA_t^d + dA_t^i, \text{ or} \quad 6.2.1.5a$$

$$dA_t = dA_t^d + \alpha_a dY_t \quad 6.2.1.5b$$

where subscript a stands for Alexander, and $(1-\alpha_a)$ for the Alexander coefficient.

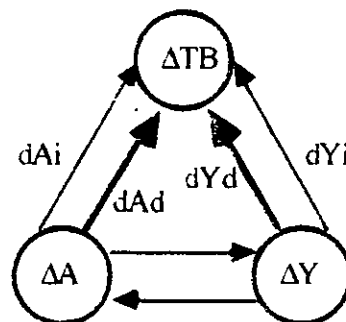
Alexander (1951, 1952) assumes unidirectional causality from ΔY to ΔA (no reverse causation) so the Alexander standard model consists of only trade balance and absorption (spending) equations without income equation. The Alexander model of 6.2.1.4 states that the effects of a devaluation on the balance of trade depend upon how devaluation affects domestic income (dY_t), upon marginal propensity to absorb (α_a), and upon the direct effect on absorption (dA_t^d). Devaluation may lead to an increase in national income due to rising exports via the traditional multiplier process, however, if α_a is larger than unity the marginal propensity to hoard $(1-\alpha_a)$ will be negative and devaluation will have a negative impact on the balance of trade because the induced effects on absorption (dA_t^i) will be larger than the original effects on production $[(1-\alpha_a) dY_t]$. Appropriately in terms of equation 6.2.1.4, a devaluation will

improve the balance of trade if the Alexander condition below is satisfied

$$dY_t(1-\alpha_a) > dA_t^d \quad 6.2.1.6$$

However since Alexander disregards the indirect effects of change in absorption on income (dY_t^i), the trade balance equation 6.2.1.4 has to be changed and the Alexander condition has to be modified [For detailed modification and criticism of the AABP hypothesis, refer to Machlup (1955, 1956), and Thiriwall (1980)]. The modified AABP hypothesis incorporating the income effects of changes in absorption can be derived formally and diagrammatically as follows

Diagram 6.2.1.1
The Direct and Indirect
Effects of a Devaluation



$$dTB_t = dY_t - dA_t \quad 6.2.1.3$$

$$dY_t = dY_t^d + dY_t^i \text{ where } \quad 6.2.1.7a$$

$$dY_t^i = \beta_{ma} dA_t \quad 6.2.1.7b$$

where $0 < \beta_{ma} \leq 1$, and subscript ma stands for modified Alexander

$$dA_t = dA_t^d + dA_t^i \quad 6.2.1.8a$$

$$dA_t^i = \alpha_{ma} dY_t \text{ where } \alpha_{ma} > 0 \quad 6.2.1.8b$$

Substituting and combining 6.2.1.7a, 6.2.1.7b and 6.2.1.8a, 6.2.1.8b into 6.2.1.3, gives income, spending and trade balance equations of the modified Alexander model as follows

$$dY_t = dY_t^d + \beta_{ma} dA_t \quad 6.2.1.9a$$

$$dY_t = (1 - \beta_{ma} \alpha_{ma})^{-1} dY_t^d + \beta_{ma} (1 - \beta_{ma} \alpha_{ma})^{-1} dA_t^d \quad 6.2.1.9b$$

$$dA_t = dA_t^d + \alpha_{ma} dY_t \quad 6.2.1.10a$$

$$dA_t = (1 - \beta_{ma} \alpha_{ma})^{-1} dA_t^d + \alpha_{ma} (1 - \beta_{ma} \alpha_{ma})^{-1} dY_t^d \quad 6.2.1.10b$$

$$dTB_t = (dY_t^d - dA_t^d) + \alpha_{ma} dY_t - \beta_{ma} dA_t \quad 6.2.1.11a$$

$$dTB_t = (1 - \alpha_{ma})(1 - \beta_{ma} \alpha_{ma})^{-1} dY_t^d - (1 - \beta_{ma})(1 - \beta_{ma} \alpha_{ma})^{-1} dA_t^d \quad 6.2.1.11b$$

in terms of equation 6.2.1.11a and 6.2.1.11b, the modified Alexander condition for a devaluation to improve the balance of trade is if only if

$$(1 - \alpha_{ma}) dY_t^d > (1 - \beta_{ma}) dA_t^d \quad 6.2.1.12$$

compared with the Alexander condition as follows

$$(1 - \alpha_a) dY_t > dA_t^d \quad 6.2.1.6$$

The causality direction of the diagram 6.2.1.1 (in terms of the income and the spending equations) is testable empirically. To test the nature of causality between ΔY and ΔA , particularly to cross examine the validity of the Alexander model *vis a vis* the rival model (the modified Alexander model), the Granger causality test will be employed then followed by the Q test to ensure the white noise of the residuals.

Since the explanatory variables in the income and the spending equations are suspected to be correlated with residuals, the method of Instrumental Variable (IV) developed by Sargan (1958) will be used to examine the AABP hypothesis.

The AABP hypothesis will then be estimated in the following econometric form

$$\Delta Y_t = \Phi_{10} + \Phi_{11} \Delta A_t + v_{1t} \quad 6.2.1.13$$

$$\Delta A_t = \Phi_{20} + \Phi_{21} \Delta Y_t + v_{2t} \quad 6.2.1.14$$

$$\Delta TB_t = \Phi_{30} + \Phi_{31} \Delta A_t + \Phi_{32} \Delta Y_t + v_{3t} \quad 6.2.1.15$$

where ΔY_{t-1} , ΔD_t and ΔM_t will be chosen as instrumental variables for the income equation; three instruments were chosen to examine the efficiency differences of IV estimates. These instrumental variables are expected to be uncorrelated with the residuals and highly correlated with ΔY_t . ΔP_t and ΔGR_t will be chosen as instrumental variables for ΔA_t . To ensure the independence of the instrumental variables to the residuals, the Hausman test will be employed to each equation. The theoretical signs are expected to be $0 < \Phi_{11} < 1$, $\Phi_{21} > 0$, $\Phi_{31} < 0$, $\Phi_{32} > 0$. The intercepts Φ_{10} , Φ_{20} , and Φ_{30} are included in the first-difference equations because it is expected that the indirect effect of changes of the theoretical model will be reflected in the intercepts, and there is a linear trend in the original or level equations.

Multicollinearity problem is suspected between the absorption and income variables owing to the fact that the independent variables are subject to similar trends and almost simultaneous ups and downs. To detect the problem, the Theil's measure of multicollinearity effect (m) will be employed where

$$m = R^2 - \sum_{h=1}^K (R^2 - R_h^2) \quad 6.2.1.16$$

where R^2 = squared multiple correlation of ΔTB_t on ΔY_t and ΔA_t , R_h^2 is squared multiple correlation from ΔTB_t on ΔA_t and from ΔTB_t on ΔY_t respectively, where $h=1,2$.

The major undesirable consequence of the multicollinearity is that the variance of the collinear variables (ΔY_t and ΔA_t) will be larger as R^2 get larger causing low t values as shown below

$$\text{var}\Phi_{31} = \sigma^2 \left\{ \sum \Delta A_{ti}^2 (1-R^2) \right\}^{-1} \quad 6.2.1.17$$

$$\text{var}\Phi_{32} = \sigma^2 \left\{ \sum \Delta Y_{ti}^2 (1-R^2) \right\}^{-1} \quad 6.2.1.18$$

where $R = \left\{ \sum \Delta A_{ti} \Delta Y_{ti} \right\} \left\{ \sqrt{\sum \Delta A_{ti}^2 \sum \Delta Y_{ti}^2} \right\}^{-1}$ is the simple correlation coefficient.

An alternative method of testing directly the effects of devaluation and the effects of domestic economic activity on the trade balance is to enter the exchange rate and domestic credit variables directly into the trade balance equation (Kyle 1976 and Miles 1979) as follows

$$\Delta TB_t = \Phi_{40} + \Phi_{41} \Delta A_t + \Phi_{42} \Delta Y_t + \Phi_{43} \Delta e_t + v_{t4} \quad 6.2.1.19$$

$$\Delta TB_t = \Phi_{50} + \Phi_{51} \Delta A_t + \Phi_{52} \Delta Y_t + \Phi_{53} \Delta D_t + v_{t5} \quad 6.2.1.20$$

In examining the hypothesis, Kyle (1976) suggested that all quantities should be nominal variables since from a balance of payments view what must be considered are nominal values. Additionally it is more applicable from a macropolicy's perspective. Accordingly all variables will be denominated in nominal values of US dollars by using the-end-of-the-year exchange rate for conversion.

Following the estimations, several diagnostic tests will be undertaken to detect regression problems (autocorrelation, heteroscedasticity, multicollinearity, and randomness of the residuals). Several tests are utilized because the regression problems may show up in different ways and various tests may not be equally powerful in detecting the particular problem. It is probable that if serious problems were present it would be diagnosed by one of the tests. The Chow test will also be employed to test for parameter stability.

6.2.2. Empirical Results

This section discusses results of the AABP hypothesis using both OLSQ and IV methods. For the estimation of the income equation of the AABP, there are three instrumental variables available, i.e., ΔA_{t-1} , ΔD_t , and ΔM_t , while for the spending equation, there are four instrumental variables for ΔY_t , namely ΔY_{t-1} , ΔP_t , ΔGR_t . A more efficient instrumental variable is also obtained by regressing ΔY_t on ΔP_t and ΔGR_t . The results of the income and the spending equations using the methods of OLSQ and IV (appendix 6.2A) show that there is not much difference between the parameter estimates obtained by the methods of OLSQ and IV. Yet it also indicates that there are similarities among the parameter estimates obtained by different instrumental variables, except for the instruments of ΔA_{t-1} and ΔY_{t-1} . The lagged dependent variables are not statistically significant compared to the other instrumental variables; this finding is credible since the lagged dependent variables (ΔA_{t-1} and ΔY_{t-1}) have the lowest correlation with the independent variables among the other instruments (appendix 6.2B).

To adjudicate empirically between the Alexander model versus the modified Alexander model, particularly to answer which model empirically is suitable for the economy, the Granger causality test was employed (appendix 6.2C). The result suggests that the direction of causality in the AABP hypothesis is from ΔY_t to ΔA_t . The estimated F values (=6.61 and 3.01) are significant at the 5% level whereas the critical F value is 2.48. On the other side, there is no reverse causation from ΔA_t to ΔY_t since the calculated F values is not statistically significant. Thus there is support for unidirectional causality from ΔY_t to ΔA_t during the period under study. This finding implies that the Alexander model is statistically more robust than the modified Alexander model in the economy during 1960 to 1988. According to these results, the Alexander model should be used instead of the modified Alexander model for the Indonesian economy (refer back to diagram 6.2.1.1).

As shown in appendix 6.2A, the methods of OLSQ and IV yield similar parameter estimates. However the OLSQ estimates are regarded as dominant equations since they pass the autocorrelation test (appendix 6.2D), moreover serial correlation among the residuals are suspected in equations estimated by IV as shown by the Durbin Watson statistics (appendix 6.2A). The spending equation passes the diagnostic tests favourably (appendix 6.2D) except for the Goodness-Fit (GF) test for normality. However this does not change the robustness of the model statistically. The spending equation estimated by OLSQ is produced as follows

$$\Delta A = 14.969 + 1.218 \Delta Y \quad 6.2.2.1$$

(t) (0.06) (35.01)

$R^2=0.975$ $d=2.136$ $\sigma=1627$

The above result indicates that as expected income appears to be significant in explaining the spending pattern in the economy, however, the magnitude of the parameter is not in accordance with *a priori* expectation that is Marginal Propensity to Absorb (MPA) is greater than zero but less than one ³. If the MPA is less than one, devaluation is really attractive policy because devaluation will have a positive effect on the national income as well as trade balance. In fact, this magnitude of the coefficient of MPA is slightly high indicating that the economy has been absorbing more than it produces. The results are plausible since increase in consumption, investment and government expenditure in the economy may be induced by higher output hence the coefficient of MPA may exceed unity. Accordingly, Suharto's devaluations would have a negative effect on the balance of trade because the "absorption" effect following devaluation would be larger than the original effects on production (the "income" effect). Alexander (1952) supports the view of high MPA, and he views

³Some economists argue that it is probable that Marginal Propensity to Absorb (MPA) is greater than one due to the investment boom in the economic development process (Winters 1985).

the phenomenon as "dissaving", however, most economists disagree (Cooper 1971, Williamson 1980). Appendix 6.2C shows that MPA (which consists of Marginal Propensity to Consume or MPC=0.714, Marginal Propensity to Invest or MPI=0.301 and Marginal Propensity to Undertake Government Expenditure or MPGE=0.217) is dominated by MPC and MPI.

From equation 6.2.2.1, the Alexander coefficient $(1-\alpha_a)$ is found out to be -0.2. By using the coefficient, the Alexander condition for devaluation to improve the trade balance in the Indonesian economy for the year of 1960 to 1988 can be calculated as follows

Table 6.2.2.1
The Alexander Condition following Devaluations + 1960-1988

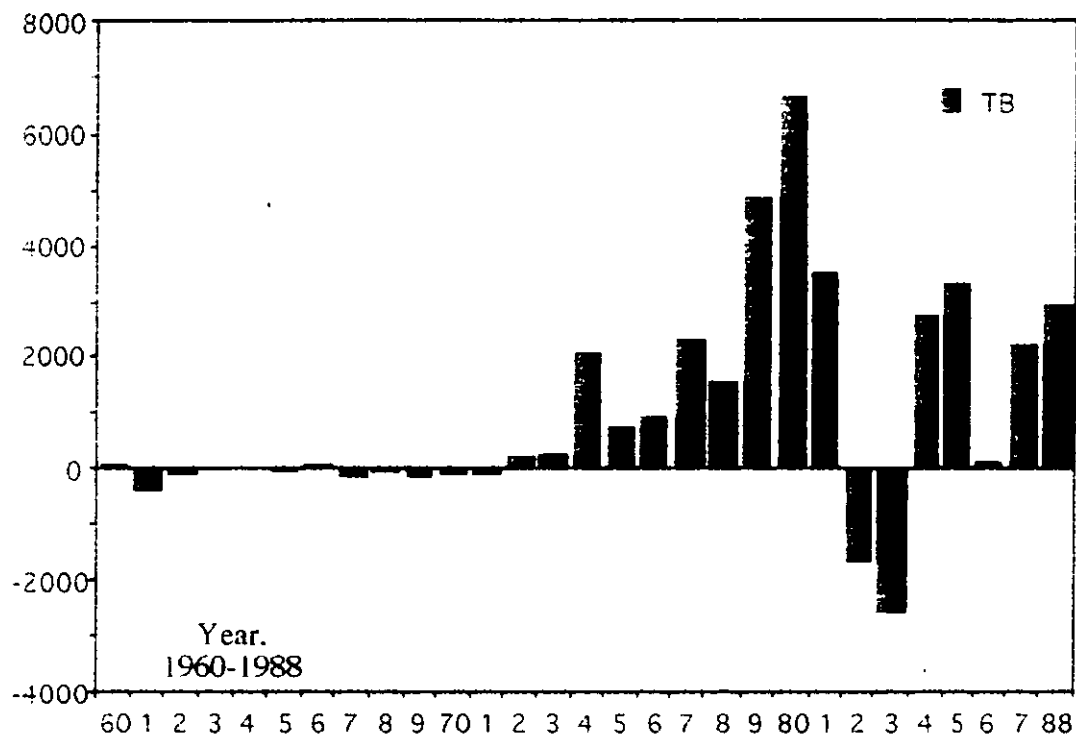
Year	Exchange Rate US \$/Rp	$(1-\alpha_a) dY \geq \leq dA$	Alexander Condition	TradeBalance Million US\$	TB Condition
1963	Rp262	-3.71 < 18.79	Not	-16.900	Deteriorate
1964	per US\$		Satisfied	-36.900	
1968	Rp326	546.37 < 2715.22	Not	-15.241	Deteriorate
1969	per US\$		Satisfied	-127.360	
1978	Rp625	2114.49 > 12428.28	Satisfied	1542.048	Ameliorate
1979	per US\$			4790.350	
1981	Rp644	4580.93 < 28191.55	Not	3497.600	Deteriorate
1982	per US\$		Satisfied	-1677.801	
1983	Rp994	1710.98 > 11905	Satisfied	-2582.199	Ameliorate
1984	per US\$			2697.600	
1985	Rp1125	2175.328 < 1144	Not	3281.000	Deteriorate
1986	per US\$		Satisfied	700.400	
1986	Rp1641	5817.76 > 29185.45	Satisfied	70.400	Ameliorate
1987	per US\$			2167.600	

As shown in table 6.2.2.1, when the Alexander condition $[(1-\alpha_a)dY_t > dA_t^d]$ was fulfilled in the years 1978, 1983 and 1986, the trade balance had improved in the next years following the

+The devaluation in this study refers to, both informal and formal changes of the exchange rate. The formal change is small adjustments of the exchange rate from time to time undertaken by the Bank of Indonesia, whereas the formal changes are large adjustments announced officially by the Indonesian government.

devaluations (see graph 6.2.2.1). However when the Alexander condition was not satisfied in 1963, 1968, 1981, and 1985, the Indonesian trade balance had deteriorated considerably in the years following the devaluations.

Graph 6.2.2.1
Merchandise Trade Balance in Million of US\$



On the trade balance equation, the independent variables (ΔY_t and ΔA_t) are found out to be correlated with each other as shown by the Theil's statistic, m (table 6.2.2.3). The independent variable ΔA , rather than ΔY , contributes most to the explanatory power of the trade balance equation. If ΔA and ΔY are correlated significantly, the value of Theil's m will be closed to unity. Since m is found to be -0.386 , it implies that the degree of multicollinearity is not significant.

Table 6.2.2.3
Multiple Correlation and
Incremental Contribution for ΔTB equation

Marginal Contribution of ΔY	$R^2 - R_{\Delta Y}^2$	0.392
Marginal Contribution of ΔA	$R^2 - R_{\Delta A}^2$	0.594
Multicollinearity Effect (m)	$R^2 - R_{\Delta Y}^2 - R_{\Delta A}^2$	-0.386
Contribution of ΔY and ΔA	R^2	0.600
Correction Factor	$R^2 - \text{Adj.} R^2$	0.032
Proportion Accounted by ΔY and ΔA	$\text{Adj.} R^2$	0.568

One of the consequences of multicollinearity is that the parameter estimates would be very sensitive to deletion and addition of observations. To adjudge the seriousness of the problem, the following equations are estimated by using only 27 observations, it yields

$$\Delta TB = -229.68 + 0.122 \Delta Y \quad 6.2.2.3$$

t (-0.40) (2.83) $R^2 = 0.241$ DW = 1.470

$$\Delta TB = 9.854 + 1.175 \Delta Y - 0.912 \Delta A \quad 6.2.2.4$$

t (-0.04) (5.57) (-5.28) $R^2 = 0.595$ DW = 2.093 $\sigma = 1312$

Comparing 6.2.2.2 and 6.2.2.4, the coefficients are almost similar, the difference is just on the constant terms. By using the predictive test for stability, it is concluded that the results are significant at 5% that the model is relatively stable during the sample period 1960-1988.

Predicting ΔTB for the year of 1987 and 1988 using 6.2.2.3 and 6.2.2.4, it yields

Table 6.2.2.4
Comparison of the Predictive Performance

Year	Predicted Value 6.2.2.3	Actual Value	Predicted Value 6.2.2.4
1987	-28.097	2097.200	3445.377
1988	544.044	744.201	13.625

Comparing the prediction from 6.2.2.3 and 6.2.2.4, they yield similar errors. If the degree of multicollinearity is significant the prediction of the model which uses all observations (6.2.2.4) should be inferior than from that which does not use all observations (6.2.2.3), and the model will also be sensitive to the sample size. In fact the equation 6.2.2.3 and 6.2.2.4 do not differ in terms of the statistical performances; they are not sensitive to the sample size. Since the variables of the trade balance equation are measured as first differences, on that account this removes much multicollinearity (Theil 1971). There is also an advantage in estimating the parameter coefficients which are jointly attributed by the independent variables ⁵.

All coefficients of the trade balance equation have the expected signs. The coefficient of ΔY indicates that each increase in ΔY will give rise to an increase in the trade balance through the multiplier effect. Conversely increases in ΔA which partly consists of ΔC , ΔI , and ΔGE will spill over to import and deteriorate the trade balance as predicted by the AABP hypothesis. The final effect, however since α_a is larger than unity, devaluation will have a negative impact on the trade balance because the induced effects on absorption will be larger than the original effects on production (Alexander 1952). The model also passes most of the diagnostic tests (appendix 6.2D). The result of the Trade Balance equation is rewritten as follows

$$\Delta TB = 30.714 + 1.222 \Delta Y - 0.964 \Delta A \quad 6.2.2.2$$

$$t \quad (-0.31) \quad (6.18) \quad (-6.00)$$

$$R^2 = 0.60 \quad DW = 2.022 \quad \sigma = 1767$$

The high t values in the trade balance equation of 6.2.2.2 also suggests that multicollinearity is not a problem. If

⁵Some economists argue that multicollinearity is not a problem for forecasting purposes (Granger 1988).

multicollinearity is significant, t values for the estimated coefficients would not be statistically significant since standard errors and t values give more accurate information about how serious the multicollinearity problem (Leamer 1973).

In the year 1980, the Indonesian trade balance reached its peak due to the receipts from the oil boom (graph 6.2.2.1), this phenomena was suspected to change the parameters constancy of the trade balance model. To examine the stability of the models, the sample was split into two equal periods (1960-1974 and 1975-1988) and the Chow test was applied. The test (appendix 6.2D) reveals that the spending equation was stable during the period of 1960 to 1988 ($F=0.713 < F_{critical}$) so were the income equation ($F=0.721 < F_{critical}$), and the trade balance equation ($F=0.119 < F_{critical}$). The model appears to be stable as indicated by the Chow test.

The results of the F variable-addition test reveals that the inclusion of the exchange rate and domestic credit variables into the trade balance equation does not improve the significance of the original model of 6.2.1.15. Although the independent variables (Δe and ΔD) have the right signs, that is, the devaluation is related to the trade deficit as discussed previously in the economy, and domestic economy is linked with trade surplus, however, based on the examination of the F and t tests, those variables Δe and ΔD are not statistically significant in explaining the trade balance movement during the period under study.

Overall the findings explain why Indonesia has been having a problem with its balance of payments. The successive devaluations were not succesful because absorption in the economy increases marginally more than its output of goods and services; excess demand apparently remains after the devaluations (since the main cause of deficit was

overabsorption). This, in turn, caused a rise in the domestic price level. Hence the competitive improvement due to the devaluations would be negated by subsequent increase in total absorption and imports ⁶ without any reduction of the previous deficit. This finding is invariant with previous empirical studies in developing countries, that is, a devaluation depresses absorption relative to output through engendering rising in costs and prices which depress the real income particularly wages of domestic consumers (Diaz-Alejandro 1966).

Since the devaluations do not cause enlargement in output and reduction in absorption, changes in exchange rate would not lead to a permanent correction in the Indonesian trade balance unless the government establish sufficiently contractive macroeconomic policies; unless absorption declines relative to production, the trade balance deficit shall persist. The government has not been succesful undertaking consecutive devaluations because Indonesia has been buying more from abroad (see also chapter 6.1) than she has been earning. Accordingly Indonesia has to pay in foreign cash which involves running down the foreign exchange reserves, hence consecutive devaluations had to be retaken.

⁶This phenomena was predicted by Nurkse (1953) 40 years ago that any increase in domestic income of developing economies is likely to put pressure on the balance of payments as people demand more imported goods.

APPENDIX 6.2A

Note on table 1 and 2

All variables are in nominal US Dollars. t-values are in parenthesis, DW is Durbin Watson statistic for autocorrelation. OLSQ is Ordinary Least Squares Estimation, IV is Instrumental Variable Estimation, Adj.R² is adjusted R² after corrected for degree of freedom. σ is standard error of the model. -- is the information not available

Table A1
Income Equation (Response Variable : ΔY_t)

Methods	OLSQ	ΔA_{t-1}	ΔD_t	ΔM_t
Constant	30.68 (0.14)	680.338 (0.85)	58.971 (0.21)	41.76 (0.16)
ΔA_t	0.803 (35.32)	0.552 (1.62)	0.792 (17.54)	0.800 (30.31)
Adj.R ²	0.975	0.873	0.974	0.974
DW (d)	2.170	1.757	2.459	2.454
σ	1321	3058	1365	1359

Table A2
Spending Equation (Response Variable : ΔA_t)

Methods	OLSQ	ΔY_{t-1}	ΔP_t	ΔGR_t	$\Delta P_t \text{ \& } \Delta GR_t$
Constant	14.969 (0.06)	-997.845 (-0.77)	58.389 (0.16)	133.270 (-0.370)	-119.063 (-0.34)
ΔY_t	1.218 (35.01)	1.699 (1.86)	1.198 (12.20)	1.292 (25.31)	1.285 (25.78)
Adj.R ²	0.975	0.807	0.974	0.969	0.970
DW (d)	2.136	1.819	2.345	2.443	2.450
σ	1627	4621	1662	1808	1785

APPENDIX 6.2B

Table B1
Matrix Correlation Coefficient
of the Trade Balance Equation

	ΔTB	ΔY	ΔA
ΔTB	1.00	--	--
ΔY	0.322	1.00	--
ΔA	0.207	0.980	1.00

Table B2
Matrix Correlation Coefficient
of the Income Equation

	ΔY_t	ΔY_{t-1}	ΔP	ΔGR
ΔY_t	1.00	--	--	--
ΔY_{t-1}	0.230	1.00	--	--
ΔP	0.390	0.014	1.00	--
ΔA	0.810	0.385	0.345	1.00

Table B3
Matrix Correlation Coefficient
of the Spending Equation

	ΔA_t	ΔA_{t-1}	ΔD	ΔM
ΔA_t	1.00	--	--	--
ΔA_{t-1}	0.270	1.00	--	--
ΔD	0.562	-0.024	1.00	--
ΔM	0.961	0.276	0.514	1.00

APPENDIX 6.2C

Table C1
Marginal Propensity to Absorp, to Consume,
to Invest and to Undertake Government Expenditure
(MPA, MPC, MPI, & MPGE), 1960-1988

Dep. Var	Constant	Indep. Var	Durbin (d)	Std Error	Adj. R^2
A	649.029 (-1.03)	1.232 (-0.77)	1.900	1410	0.998
C	-1174.735 (-2.57)	0.714 (65.53)	2.085	1122	0.997
I	-1096.415 (-1.47)	0.301 (17.70)	2.306	1196	0.981
GE	-712.920 (-2.77)	0.217 (34.53)	2.078	774	0.984

Table C2
Granger Causality Test

DepVar	ΔY_{t-1}	ΔY_{t-2}	ΔA_{t-1}	ΔA_{t-2}	F Stat	Q Stat
ΔA_t	-2.274 (-2.01)	-	3.201 (2.32)	-	6.610	8.696
ΔY_t	2.038 (1.69)	-	-1.660 (1.70)	-	1.880	7.755
ΔA_t	3.291 (2.00)	-	-2.353 (-1.63)	0.022 (0.09)	3.011	8.370
ΔY_t	0.921 (0.863)	0.473 (-1.82)	-1.017 (-1.16)	-	1.903	6.694

Table C3
Alternative Trade Balance Functions

$\Delta TB_t = 114.040 + 1.210 \Delta Y_t - 0.963 \Delta A_t - 0.706 \Delta e_t$ (0.33) (5.94) (-5.86) (-0.313)
Adj. $R^2 = 0.529$; DW = 2.015 ; $\sigma = 1360$
$\Delta TB_t = -71.586 + 1.100 \Delta Y_t - 0.870 \Delta A_t + 0.140 \Delta D_t$ (-0.27) (5.85) (-5.53) (0.857)
Adj. $R^2 = 0.529$; DW = 2.015 ; $\sigma = 1360$

APPENDIX 6.2D

Table D1
Diagnostic Tests on the Income, Spending
and Trade Balance Equations ⁷

Equation	Income	Spending	Trade-Balance	Critical Value
Durbin-Watson ⁸	2.170	2.136	2.022	$d_l 1.33 \& d_u 1.50$ $d_l 1.25 \& d_u 1.55$
BPG test ⁹	0.02	0.08	1.05	3.84 & 5.99
Harvey test ¹⁰	0.68	0.40	0.70	3.84 & 5.99
GF test ¹¹	4.18	11.34	2.77	3.84 & 5.99
Chow test ¹²	F14,14=0.71	F14,14=0.72	F14,14=0.12 F20,8=0.23	3.40 & 3.05
Ramsey-Reset test ¹³	$R^2=5.16$ $R^3=3.11$ $R^4=3.38$	3.31 1.75 2.90	0.71 1.29 1.24	4.26 3.40 3.01
Theil's m ¹⁴	n.a	n.a	0.386	1.00

Table D2 ¹⁵
Diagnostic Results for the Income, Spending
and Trade Balance equations

Problem	Income	Spending	Trade Balance
Autocorrelation	✓	✓	✓
Heteroscedasticity	✓	✓	✓
Normality	✓	✗	✓
Stability	✓	✓	✓
Specification Error	✓	✓	✓
Multicollinearity	n.a	n.a	✗

⁷0.05 level of significance. n.a means the statistic not available.

⁸Autocorrelation test.

⁹Heteroscedasticity test - χ^2 distribution $\{e^2 = \phi_1(\text{Regressors})\}$.

¹⁰Heteroscedasticity test - χ^2 distribution $\{\ln e^2 = \phi_2(\text{Regressors})\}$.

¹¹Normality test - χ^2 distribution $\{GF = \text{Goodness-Fit test}\}$.

¹²Parameter Stability test - F distribution.

¹³Specification Error test - F distribution.

¹⁴Multicollinearity test.

¹⁵✓ indicates the model passes the test. ✗ indicates the model does not pass. n.a indicates the information not available.

6.3. THE MONETARY APPROACH TO THE BALANCE OF PAYMENTS (THE RESERVE MODEL)

Indonesia has been suffering from recurrent balance of payments deficits during the past 20 years, accordingly international reserve flows have been an influential matter for the economy. While two empirical approaches to the balance of payments, the EABP and the AABP theories, have been previously discussed. The more recent view of the balance of payments namely the MABP theory has been gaining reputation in the economic literature. The MABP theory has various empirical versions; surveys of the empirical literature can be obtained for example in Polak (1957), Genberg (1976), Bean (1976), Magee (1976), Zecher (1976), Connolly-Taylor (1976), Guitian (1976), Edward (1979), Aghevli-Khan (1977), Krenin-Officer (1978), Uddin (1985), Spanos-Taylor (1985) and Frenkel-Mussa (1985). The various empirical works have generated diverse results because of dissimilar specifications and data sets. Despite the diversity the basic insight of the MABP theory is that it brings out the real balance effect more cogently than the other approaches to the balance of payments. The MABP emphasizes the relationship between a nation's overall balance of payments position and divergences between the supply of and the demand for money. It could also be seen as an extension of the AABP in the case of an open economy. In the open economy, changes in the money stock can arise from domestic credit creation and foreign exchange operations by the Authorities. The MABP theory argues that balance of payments fluctuations, which are reflected in the changes of foreign exchange reserves, are associated with the disequilibrium in the money market formally as follows

$$\Delta R = f (M^d - M^s)$$

6.3.1

that the change in foreign exchange reserves (ΔR) is related to the gap between the demand for (M^d) and the supply of money (M^s). If the money demand increases more rapidly than the supply of money (based on the government expansion of the domestic assets), then a nation would experience a balance of payments surplus. In contrast, if a nation suffers from a deficit or a loss of foreign exchange reserves, the appropriate monetary policy would be contraction in the money supply. Thus, the government can affect the level of foreign exchange reserves by altering the composition of the monetary base through deliberate and meaningful money market management and credit policy. Devaluation of the currency however has only little effect on the flow of foreign exchange reserves; it will improve the balance of payments just temporally (Frenkel-Johnson 1976). The MABP theory emphasizes the fact that the balance of payments is essentially a monetary phenomenon; it should be analyzed using the tools of monetary analysis in terms of adjustment in the money stock ¹.

The purpose of this section is to examine the MABP proposition, especially to investigate the relationship between domestic credit expansion and international reserve flows for the year of 1967-1988 (during the period of *Pelita I* to *Pelita IV*) and 1974-1988 (during the period of *Pelita IV* only) by using annual Indonesian data. This section 6.3 is organized into two parts. Part 6.3.1 explains methodology in deriving the Reserve Model (RM) which will provide the basis for testing the MABP

¹This direct relationship between balance of payments flows and the domestic money supply depends on the key assumption that the Authorities do not engage in sterilization operations to offset the domestic monetary consequences of the balance of payments deficits or surpluses. The MABP does not consider such sterilization operations feasible in a world of integrated financial markets and a high volume of interest-sensitive international capital flows.

proposition whereas part 6.3.2 presents empirical observations and conclusions.

6.3.1. Methodology

The MABP hypothesis concentrates primarily on the money markets, in which the relationship between the demand for and the supply of money is regarded as the main determinant of balance of payments flows. This section derives the demand for and the supply of money equations, then brings those equations into equilibrium to establish the Reserve Model (RM).

On the demand side, the demand for money in real terms (μ) is postulated to be a function of real income (Y^r), the domestic interest rate (i), and the rate of domestic inflation (Π)² as follows

$$\mu = M^d / P = \psi (Y^r, i, \Pi) \quad 6.3.1.1$$

Differentiating 6.3.1.1 logarithmically with respect to time, gives

$$d\mu/dt = d\mu/dY^r dY^r/dt + d\mu/di di/dt + d\mu/d\Pi d\Pi/dt \quad 6.3.1.2$$

By manipulation, 6.3.1.2 reduces to 6.3.1.3 and 6.3.1.4

$$d\mu/dt \mu^{-1} = \xi_{Y^r} Y^{r-1} dY^r/dt + \xi_i i^{-1} di/dt + \xi_{\Pi} \Pi^{-1} d\Pi/dt \quad 6.3.1.3$$

$$M^{d-1} dM^d/dt = \xi_{Y^r} Y^{r-1} dY^r/dt + \xi_i i^{-1} di/dt + \xi_{\Pi} \Pi^{-1} d\Pi/dt + P^{-1} dP/dt \quad 6.3.1.4$$

²Detailed data definitions and symbols are given previously in chapter 5.

On the supply side, real money is defined as the product of the money multiplier and the stock of high-powered money which consists of international reserves and domestic credit creation of the central bank or

$$M^s = \lambda H = \lambda (R+D) \quad 6.3.1.5$$

Equation 6.3.1.5 may be restated as 6.3.1.6 and 6.3.1.7 as follows

$$M^{s-1} \frac{dM^s}{dt} = R H^{-1} \frac{dR}{dt} R^{-1} + D H^{-1} \frac{dD}{dt} D^{-1} + \lambda^{-1} \frac{d\lambda}{dt} \quad 6.3.1.6$$

$$R^{-1} \frac{dR}{dt} = R^{-1} H (M^{s-1} \frac{dM^s}{dt} - \lambda^{-1} \frac{d\lambda}{dt}) - R^{-1} D \frac{dD}{dt} D^{-1} \quad 6.3.1.7$$

Long-run equilibrium in the money market implies that $M^d = M^s$, accordingly the key relationship of the MABP hypothesis can be rewritten by substituting 6.3.1.4 into 6.3.1.7 to give

$$R^{-1} \frac{dR}{dt} = R^{-1} H [P^{-1} \frac{dP}{dt} + \xi_{yr} Y^{r-1} \frac{dY^r}{dt} + \xi_i i^{-1} \frac{di}{dt} + \xi_{\pi} \Pi^{-1} \frac{d\Pi}{dt} - \lambda^{-1} \frac{d\lambda}{dt}] - R^{-1} D \frac{dD}{dt} D^{-1} \quad 6.3.1.8$$

Rewriting equation 6.3.1.8 for econometric investigation yields the unrestricted form 6.3.1.9 and restricted form 6.3.1.10 of the Reserve Models as follows

$$R H^{-1} R^{-1} \frac{dR}{dt} = \omega_0 + \omega_1 Y^{r-1} \frac{dY^r}{dt} + \omega_2 P^{-1} \frac{dP}{dt} + \omega_3 \Pi^{-1} \frac{d\Pi}{dt} + \omega_4 i^{-1} \frac{di}{dt} + \omega_5 (\lambda^{-1} \frac{d\lambda}{dt} + D H^{-1} \frac{dD}{dt}) + \omega_6 \quad 6.3.1.9$$

where it is expected that $\omega_1 > 0$, $\omega_2 = 0$, $\omega_3 < 0$, $\omega_4 < 0$, $\omega_5 = -1$.

$$(R H^{-1} R^{-1} \frac{dR}{dt} - P^{-1} \frac{dP}{dt}) = \theta_0 + \theta_1 Y^{r-1} \frac{dY^r}{dt} + \theta_2 \Pi^{-1} \frac{d\Pi}{dt} + \theta_3 i^{-1} \frac{di}{dt} + \theta_4 (\lambda^{-1} \frac{d\lambda}{dt} + D H^{-1} \frac{dD}{dt}) + \theta_5 \quad 6.3.1.10$$

where as expected $\theta_1 > 0$, $\theta_2 < 0$, $\theta_3 < 0$, $\theta_4 = -1$.

In the empirical literature, a wide range of alternative specifications ³ of the general Reserve Models (RM) are tested. The various Reserve Models used in this study to examine the MABP proposition are presented in table 6.3.1.1 below.

Table 6.3.1.1
The Empirical Models of the MABP (the Reserve Models)

1. Zecher-Genberg (1976) Model $R/H \Delta \ln R = \alpha_{10} (D/H \Delta \ln D + \Delta \ln \lambda) + \alpha_{11} \Delta \ln Y^r + \alpha_{12} \Delta \ln P + \alpha_{13} \ln i + v_1$
2. Bean (1976) Model $R/R+D \Delta \ln R = \alpha_{20} (D/R+D \Delta \ln D + \Delta \ln \lambda) + \alpha_{21} \Delta \ln Y^r + \alpha_{22} \Delta \ln P + \alpha_{23} \Delta \ln i + v_2$
3. Aghevli-Khan (1977) Model $R/H \Delta R/R-1 = \alpha_{30} (D/H \Delta D/D-1 + \Delta \lambda/\lambda-1) + \alpha_{31} \Delta Y^r/Y^r-1 + \alpha_{32} \Delta P/P-1 + \alpha_{33} \Delta i/i-1 + v_3$
4. Uddin (1985) Model $R/R+D \Delta R/R-1 = \alpha_{40} (D/R+D \Delta D/D-1 + \Delta \lambda/\lambda-1) + \alpha_{41} \Delta Y^r/Y^r-1 + \alpha_{42} \Delta P/P-1 + \alpha_{43} \Delta i/i-1 + v_4$
5. Connolly-Taylor (1976) Model $\Delta \Delta R/M = \alpha_{50} \Delta \Delta D/M + \alpha_{55} \Delta \Delta e/e-1 + v_5$
6. Guitian (1976) Model $\Delta R = \alpha_{60} \Delta D + \alpha_{61} Y^n + \alpha_{62} P + \alpha_{66} P^* + v_6$
7. Edward (1979) Model $\ln R = \alpha_{70} \Delta \ln M + \alpha_{71} \ln Y^n + \alpha_{77} \ln R-1 + v_7$
8. Spanos-Taylor (1985) Model $\Delta R/R+D = \alpha_{80} (\Delta D/R+D + \Delta \ln \lambda) + \alpha_{81} \Delta \ln Y^r + \alpha_{83} \Delta \ln P + \alpha_{84} \ln i + v_8$ $\Delta R/H = \alpha_{90} (\Delta D/H + \Delta \ln \lambda) + \alpha_{91} \Delta \ln Y^r + \alpha_{93} \Delta \ln P + \alpha_{94} \ln i + v_9$

Although there are variations among these empirical formulations of the MABP hypothesis, the basic structure is as follows

$$R = \Phi (D, Y, P, P^*, \lambda, i) \quad 6.3.1.11$$

Direct estimation of the Reserve Model by OLSQ is problematic. The main reason is the endogeneity of domestic credit when the authority follows a sterilization policy. If domestic credit is

³This study however does not replicate all of the Reserve Models used in the empirical literature (chapter 4.2). The models are selected on their statistical performances.

systematically varied in response to the balance of payments then the domestic credit variable will be correlated with the disturbance term. Consequently the OLSQ estimation of the Reserve Model will be inconsistent, and statistical tests for deviation of the domestic credit coefficient known as the offset coefficient in the literature from minus unity (chapter 4.2) will not be reliable due to the simultaneous equation bias. The method of Instrumental Variables (IV) is suggested therefore (Magee 1976, Obstfeld 1982). Unfortunately the IV results are biased in small samples and have higher standard errors than the corresponding OLSQ estimates (Kennedy 1979). Since the study is based on small numbers of observations, it is by no means clear that the IV estimates are superior to the OLSQ estimates for the problem at hand. In any case, the conclusions based on the IV estimates are expected to be similar to those based on the OLSQ estimates. The RM will be estimated by using single estimation procedure (OLSQ), however, the simultaneous estimation of the RM will also be presented in chapter 7 to empirically compare the statistical performances of the single estimation procedure *vis a vis* the simultaneous one.

This study concentrates particularly on the Aghevli-Khan (AK) model since the model has been used extensively to test the MABP proposition in the developing countries (Aghevli-Khan 1978, Bhatia 1982, and Uddin 1985). In addition most of the other models have been employed to examine the MABP proposition in developed economies (Kreinin-Officer 1978). Nevertheless this section will report briefly on the replication of the other models such as the Zecher-Genberg model, the Bean model, the Uddin model, the Connolly-Taylor model, the Guitian model, the Edward model, and the Spanos-Taylor model for Indonesian data (table 6.3.1.1).

6.3.2. Empirical Results

The period under study of the MABP hypothesis differs with those of the EABP and the AABP hypotheses. The MABP study refers only to the period of 1967 to 1988, because as suspected most of the Reserve Models were disrupted by structural changes that happened in the transitional period of the economy in 1965-1966. Major economic and structural changes happened when the *Orde Baru* Cabinet under General Suharto took over the government from the *Orde Lama* following the 1965 revolution. As the Suharto government strengthened its position in 1966, a new set of economic priorities emerged in various policy statements. Production of basic needs was to be emphasized, foreign investments was to be encouraged especially in the mining and manufacturing sectors, and the Indonesian rupiah value was to be changed; one new Rupiah would be equal to the one thousand old Rupiah. The period of restoration was characterized by unstable economic indicators such as price level, international reserves, money supply and domestic credit. However the final result was dramatic, a sudden improvement occurred in the Indonesian growth rate after the 1965 revolution (Booth-McCawley 1981). When the Reserve Models were estimated for the whole period 1960-1988, the statistical results indicated that the relationship between dependent and independent variables in most of the Reserve Models underwent a structural change as shown by the Chow test (appendix 6.3A); the models performed poorly when applied for the whole year of 1960-1988 as indicated by the statistical performances and the signs of the estimated parameters. Only the Connolly-Taylor model and the Guitian model passed the stability test.

The unrestricted estimation and restricted estimation of the Reserve Models for 1967-1988 by OLSQ are given in appendix 6.3B. The restricted estimation is calculated if the estimated price coefficient is not significantly different from unity based on F and t tests. Whenever necessary the Reserve Models

are re-estimated by the Cochrane-Orcutt iterative procedure to cure for autocorrelation problems.

Table 6.3.2.1 ⁴
The Significance of the Regressors 1967-1988

Variables	D	P	P*	Π	Y	λ	i	Ξ	R-1
Theoretical Sign	-	+	+	-	+	-	-	+	+
Zecher-Genberg Model	--	++		-	++	-	-		
Bean Model	--	++		--	++	-	-		
Uddin Model	--		++	--	+	-	-		
Connoly-Taylor Model	--								
Guttan Model	-	+	-		-				
Edward Model	--				+				+
Spanos Taylor Model	-	++			++	-	-		

Several vital findings emerge from the results in table 6.3.2.1 :

- The major prediction of the MABP theory that the domestic-credit coefficient should be negative appears to be verified in all cases. However the coefficient seems to be relatively low in the range of -0.200 to -0.300 compared with the theorized value of minus unity. Only the Uddin model generates a significant domestic-credit coefficient of -1.140 which is in line with the MABP hypothesis that the offset coefficient is significantly equal minus unity.
- The interest-rate variable performs poorly for all models. It is credible since most of the years, particularly during the year 1960-1966 the nominal interest rate stays flat; it was administratively determined by the Authorities rather than

⁴Double sign (++ or --) indicates that the finding is statistically significant at 0.05 level whereas blank indicates the information not available. Detailed data definitions and symbols are given previously in chapter 5.

market determined. After 1974, however, the nominal interest rate has been left to market forces after the restoration of the economy by the *Orde Baru* during the First Five-Year Development Plan (*Pelita I*) in the period 1969-1973.

•There still appears to be sufficient evidences to suggest the applicability of the MABP proposition to the Indonesian economy from 1967 to 1988. All estimated coefficients of the Reserve Models yield the signs as expected by the MABP theory that growth in income and price lead to growth in reserves, and an increase in domestic credit, interest rate and money multiplier leads to a decline in foreign exchange reserves. However the significant influences on the foreign exchange reserves fluctuations in 1967-1988 seem only to be from the inflation and domestic credit variables.

A likelihood ratio test (LR) was used to determined whether the restricted Reserve Models produce the same result as the unrestricted ones. Table 6.3.2.2 below contains the relevant statistics for comparing the models.

Table 6.3.2.2
Model Restriction Tests 1967-1988

Model	Log of Likelihood	Actual Value of $-2\log\lambda$	Critical Value χ^2 at 5 %	Restriction is valid or invalid
Zecher-Genberg Model	-0.285	-1.421	3.84	Valid
	-0.580	-0.238	3.84	Valid
Bean Model	19.646	0.001	3.84	Valid
	19.315	0.035	5.99	Valid
Uddin Model	22.650	—	3.85	—
Spanos-Taylor Model	25.462	0.082	3.84	Valid
	1.025	0.960	3.84	Valid

From an econometric pespective, the results in table 6.3.2.2 suggest that the assumption of homogeneity in prices can not be rejected. This result is in line with the studies by Aghevli-Khan (1974) and Bhatia (1982) both of which refer to developing economies. Additionally the restricted

specifications such as equation 6.3.1.10 are superior to the unrestricted ones in terms of their statistical performances.

The next part discusses the regression estimates of the selected model, the Aghevli-Khan (AK) model. The alternative estimate of the AK model with a time trend added is presented in appendix 6.3C. The result in table 6.3.2.3 indicates that for the years 1967-1988 all estimated parameter coefficients have the expected signs however only the price and income variables appear to be statistically significant although the sign of the income variable is "incorrect". The other estimated coefficients, although have the right signs, are not statistically significant.

Table 6.3.2.3
OLSQ Estimates of AK Model 1967-1988
for the Equation 6.3.1.9 - Regressand $RH^{-1}\Delta R$

Regressors	Estimated Coefficients	t - Ratios	Partial Correlation
Constant	0.182	0.58	0.140
$\Delta P/P-1$	2.033	2.80	0.562
$\Delta i/i-1$	-0.127	-0.36	-0.856
$\Delta Y_r/Y_r-1$	-2.299	-2.83	-0.709
$\Delta \Pi/\Pi-1$	0.781	0.92	0.232
$DH^{-1}\Delta D/D-1+\Delta \lambda/\lambda-1$	-0.153	-0.50	-0.767
Chow 67-73, 74-88=3.64	F table 4, 14=3.11	DW=2.57; $\sigma=0.808$	Adj. $R^2=0.193$

Indonesia, as an oil exporting country benefited from the oil boom of 1973. It caused dramatic increases in the Indonesian foreign exchange reserves. The *Orde Baru* government of General Suharto which took effective control in March 1966 gave first priority to the restoration of the economy. By 1975-1976 the Suharto government's economic policies combined with the effect of the oil price increases of 1973 had led to a

marked change in the structure of the economy. This episode is suspected to disrupt the parameter stability of the AK model. Accordingly the samples were split up into two periods (1967-1973 and 1974-1988), then the Chow test was applied for the AK model. The result indicates that there had been structural shifts in the AK model after the year 1973 (Chow=3.64>Fcritical=3.11). The AK model was then re-estimated for the years 1974-1988 using only 15 observations; this yields significantly different parameter estimates than the AK model estimated using all 22 observations. The period 1974-1988 was emphasized throughout the study since it had been characterized by persistent devaluations in the years 1973, 1981, 1983, and 1986. In addition the purpose of the study is to evaluate the effectiveness of such macropolicy to the determination of the Indonesian balance of payments for the period of *Pelita IV* from 1974-1988.

Table 6.3.2.4 ⁵
OLSQ Estimates of AK Model 1974-1988
 for the Equation 6.3.1.9 - Regressand $RH^{-1}\Delta R$

Regressors	Estimated Coefficients	t - Ratios	Partial Correlation
Constant	0.532	2.68	0.738
$\Delta P/P-1$	4.814	4.04*	0.855
$\Delta i/i-1$	-1.703	-4.06*	-0.856
$\Delta Y_T/Y_T-1$	-3.255	-1.47	-0.710
$\Delta \Pi/\Pi-1$	0.854	5.72*	0.919
$DH^{-1}\Delta D/D-1+\Delta \lambda/\lambda-1$	-0.153	-0.50	-0.767
$\sigma=0.202$	Ftable 4.14=7.03	DW=2.250	Adj. R ² =0.733

Due to problem of autocorrelation, the AK model was re-estimated by the Cochrane-Orcutt iterative procedure. The

⁵The superscript * means that the coefficient is statistically significant at 0.01 level.

regression passes the Geary test of zero autocorrelation of the disturbance terms for small sample ($3 < n < 11$) at the 0.05 level of significance. To test for heteroscedasticity, the Glejser and the Goldfeld-Quand tests are used for ranking the observation and examining the variances. The final result indicates that the null hypothesis of homoscedasticity cannot be rejected at 5 percent level of significance. Adjusted R^2 for degree of freedom ($=0.733$) shows a good fit indicating the regression explains about 73 percent of the variation in the foreign exchange reserves in the Indonesian economy. Moreover the overall F value ($=7.03$) passes the significance test even at 1 percent level leading to the acceptance of the hypothesis that the growth in real income, in prices, in inflation, in domestic credit, in money multiplier, and in domestic interest rate influenced significantly the growth in international reserves during the period 1974-1988. Table 6.3.2.4 reveals that all estimated coefficients are statistically significant at 0.05 level. The sign of the home interest elasticity of international reserve is negative, and significant even at 0.01 level; this might be caused by the restoration of the economy toward market forces after 1966 (before 1965 the domestic interest rate was administratively determined by the government not determined by market forces).

This outcome is in line with the theoretical expectation of the MABP theory that an increase in the domestic interest rate would depress money demand causing an excess supply of money (outflow of international reserves) and subsequently a deficit in the balance of payments ⁶. However, this result is somewhat contradictory because it is expected that domestic interest rate does not play a significant role in the determination of money market in developing economies (Meiselman 1970, Wong 1977). The sign of estimated price

⁶The finding is at variance to the CMABP theory that an increase in the domestic interest rate will attract foreign investment leading to capital inflows and a surplus on the balance of payments.

elasticity of foreign exchange reserves is in conformity with the MABP theory; an increase in the price level will lead to a desire by the Indonesian residents to restore the real value of their cash balances, and an improvement in the balance of payments (via increased reserves). Basically this result proves one of the basic principles of the MABP hypothesis that the balance of payments is fundamentally a monetary phenomenon in which domestic prices are expected to correlate positively with the balance of payments via a rise in the demand for money. There are a number of empirical studies which support the robustness of the demand for money function in Indonesia, *inter alia*, Boediono (1985), Aghevli (1976), and Aghevli et al (1979). Boediono shows that the domestic inflation rate and the domestic interest rate influence significantly the demand for money in Indonesia. Boediono's estimates ⁷ for the short-run (6.3.1) and the long-run (6.3.2) quarterly demand for money in Indonesia (1975-1984) are as follows

$$M_t^d = \text{constant} + 0.33855 Y + 0.08995 \Pi_t - 0.01138 \Delta i_t \quad 6.3.2.1$$

$$M_t^d = \text{constant} + 1.47613 Y + 0.02063 \Pi_t - 0.00261 \Delta i_t \quad 6.3.2.2$$

However the size of the price elasticity (table 6.3.2.4) is unexpectedly large (three times larger of the theorized value). Previous statistical works for other countries (Zecher 1976, Aghevli-Khan 1977, Uddin 1985) indicate that the price elasticity should be less than one if a high degree of money illusion exists, otherwise the value would be close to unity if there is no money illusion. This high price elasticity in the economy may be due to the fact that the economy was characterized by rising price level through import-push inflation on the account of the "cheap money" policy and successive devaluations established by the Indonesian government during that period (Grenville 1977).

⁷The model is estimated in semi-elasticity form ($d \ln Y / dX$).

The most essential value for verifying the MABP hypothesis lies in the magnitude of the estimated coefficient of the growth in domestic credit ($\Delta H^{-1} \Delta D$) known as the offset coefficient in the literature. The finding indicates that the offset coefficient is significantly equal to the hypothesized value of minus 1, that is, an increase of 1 percent in the domestic credit by the Bank of Indonesia will lead to an about equivalent shrinkage in the foreign exchange reserve. The examination of the changes of the growth in the foreign exchange reserve and the growth in domestic credit expansion from 1974 to 1988 (table 6.3.2.5) indicates that each increase in the domestic credit leads ultimately to a corresponding loss in reserves.

Table 6.3.2.5 ⁸

Rate of Changes in the variables of ΔD , ΔR , and ξ

Year	Changes in $\Delta D/D-1$	Changes in $\Delta R/R-1$	Changes in ξ^{**}
1974 - 1977	+ 9.38 %	- 27.61 %	- 6.51 %
1978 - 1982	+ 921.15 %	- 533.07 %	- 105.69 %
1979 - 1982	+ 533.61 %	- 134.04 %	- 45.94 %
1983 - 1986	+ 19.61 %	- 106.94 %	- 80.79 %

As shown by table 6.3.2.5, in 1974-1977 an increase in the growth of domestic credit (+9.38 %) was offset by a decrease in the growth of foreign exchange reserves (-27.61%) leading to the 1978 devaluation from Rps 415 per US \$1 to Rps 442 per US \$1. The same phenomena happened in 1978-1982, and 1983-1986. In fact when there was a big boost in the domestic credit expansion (+921.15%) from 1978 to 1982, the growth in reserves was diminished drastically (-533.07%), then in the following year 1983 the Bank of Indonesia was running low in

⁸The superscript ** indicates the percentage of Indonesian Rupiahs lost value due to devaluation.

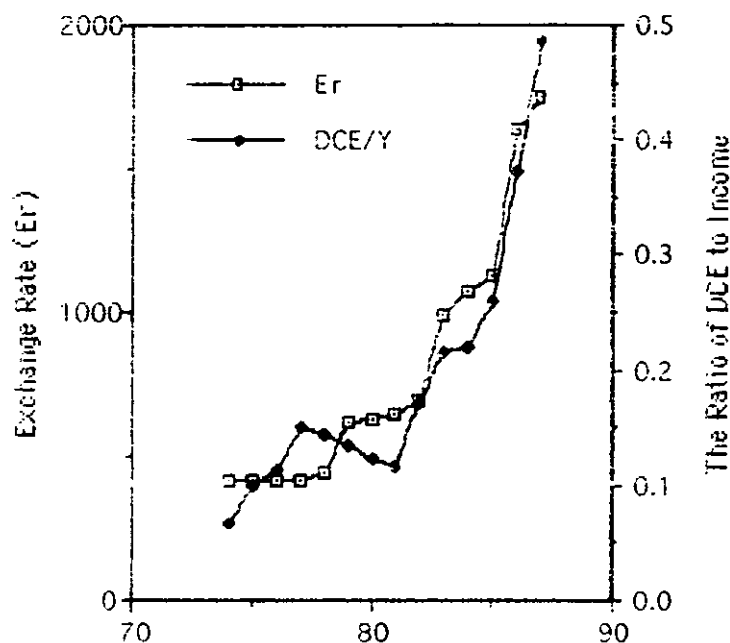
reserves. Consequently a sudden devaluation was needed to draw back in more foreign exchange reserves. The results were that the Indonesian rupiah lost value of 105.69%, from Rp 442.05 (the rupiah's dollar value) to Rp 909.26 due to the big devaluation in 1983. To scrutinize whether or not this big devaluation in 1983 disturbed the AK model, the samples again were divided into two periods (1974-1982 and 1983-1987) then the modified Chow test for small samples was applied. The final results suggests that the AK model presented was stable for the whole period of 1974-1988; the large devaluation in 1983 did not interrupt the system significantly. The relationship among the growth in reserves and all the explanatory variables do not change significantly between those two periods (1974-1982 and 1983-1987).

Nevertheless not all estimated coefficients support the MABP hypothesis. Two estimated coefficients, the income and inflation elasticities of international reserve, have the wrong sign which require further explanations. The income coefficient appears to be negative and statistically insignificant for the second period 1974-1988 but negative and significant for the whole period 1967-1988; the size of the income coefficient is also relatively large. This does not confirm the MABP hypothesis that the balance of payments and economic growth will always move together. Paradoxially the result is more in line to the traditional Keynesian AABP hypothesis that an expansion in the real income will spill over to imports cutting down the foreign exchange reserve then deteriorating the balance of payments. This phenomenon may be due to the fact that the economic growth in the period of the Second to the Fourth Five Year Development Plan (*Pelita II* to *Pelita IV*), 1974 to 1988, came primarily from the growth in the money stock (via an enlargement in domestic credit expansion). Under the pressure of massive increases in reserves due to rising oil revenues, the Bank of Indonesia was unable to avoid excessive

domestic credit expansion because the assets market is not yet developed for sterilization operations.

Graph 6.3.2.1 shows an increase in the ratio of domestic credit expansion to income followed by the rising rupiah's dollar value during 1974-1988 period. The rise in international reserves due to oil exports was offset by rising spending which spills over to imports through the expansion of domestic credit by the Bank Indonesia and the commercial banks. Yet the banking deregulation in 1983 (the "open window" system which gave the commercial banks direct access to international reserve money) aggravated the situation. This phenomena may explain partly the negative association between the real income and the foreign exchange reserve in the period of 1974-1988. The positive sign of the estimated inflation elasticity ($=0.8950$) do not also validate the MABP proposition; in fact an increase in the growth of inflation raised the money demand through the direct effect of higher prices outweighing the indirect effect of rising opportunity cost of holding money. This in turn improves the balance of payments. This finding is reinforced by most studies in less developed countries that the expected rate of inflation is observed as a major variable in escalating the money demand (Hyness 1967; Campbell 1970; Deaver 1970). The inflation variable, with the highest partial correlation coefficient ($=0.919$) contributes most to the explanatory power of the AK model highlighting the importance of the inflation variable in determining foreign exchange reserve flows (via the demand for money in) the economy.

Graph 6.3.2.1
The Pattern of D/Y and Er (₪)



The results for the alternative estimate of the AK models (appendix 6.3C) are relatively similar to the previous findings. All the parameter coefficients are also significant except time trend coefficients which are not statistically significant. Although the magnitude of the estimated coefficients is somewhat different, it does not alter the previous conclusions significantly. This section reveals that for the period of 1967-1988 the growth in price and in income were associated with the balance of payments surpluses, while the growth in inflation, interest rate, money multiplier, and domestic credit expansion were not significantly associated with balance of payment deficits. However for a more recent period, 1974-1988, the growth in price and in inflation were associated with the balance of payments surpluses, while the growth in income, interest rate, money multiplier, and domestic credit expansion were related with balance of payment deficits. Yet the offset coefficient for the period 1974-1988 was significantly equal to the expected value of the MABP proposition.

Although not all regression results provide full support for the MABP hypothesis, however, some suggest significant monetary influences on Indonesia's balance of payments. This in turn has important policy implications for Indonesia; an increase in the domestic element of Indonesian high-powered money via domestic credit, by either the Bank of Indonesia or commercial banks, will spill over in the balance of payments. It follows that a continuous balance of payments deficit in the Indonesia economy occurred partly because of the amplification of domestic credit particularly in the period of 1974-1988. Indonesia could not achieve any permanent expansion of domestic credit without hazarding its balance of payments. Thus, to counteract a lasting deterioration in the Indonesian balance of payments, any escalation in domestic credit in one period must be offset by a diminution in domestic credit in a subsequent period. This suggests that monetary policy namely the management of domestic credit should be used to attain the desired stock of international reserve or the balance-of-payments target. The other interesting result for the more recent period 1974-1988 is a negative relationship between the economic growth and the inflation growth with the balance of payments. These results are more in line with the Keynesian Absorption Approach theory rather than the Monetary Approach theory itself ⁹.

⁹The AABP hypothesis argues that a rise in income will spill over to import causing a deficit in the balance of payments, on the contrary the MABP hypothesis argues that an increase in income will raise the demand for money causing balance of payments surplus through enlargement of the foreign exchange reserves (chapter 3.2 and 3.3).

APPENDIX 6.3A

The Stability Test of the Reserve Model 1960-1988

1. Zecher-Genberg (1976) Model

$$R/H \Delta \ln R = 0.594 D/H \Delta \ln D + 1.320 \Delta \ln Y^r - 0.007 \Delta \ln P - 0.799 \Delta \ln \lambda - 0.086 \Delta \ln i$$

(0.73) (3.63) (-0.13) (-0.91) (-0.50)

R² 0.138 DW 1.268 σ 14.594 OLSQ
 Stability Test Chow_{60-66,67-88} 1816.3 F_{critical} 2.77

2. Bean (1976) Model

$$R/R + D \Delta \ln R = 0.158 D/R + D \Delta \ln D + 0.121 \Delta \ln Y^r - 0.296 \Delta \ln P + 0.112 \Delta \ln \lambda - 0.046 \Delta \ln i$$

(0.96) (0.89) (-1.81) (0.13) (0.04)

R² 0.189 DW 1.439 σ 0.296 OLSQ
 Stability Test Chow_{60-66,67-88} 23.424 F_{critical} 2.74

3. Aghevli-Khan (1977) Model

$$R/H \Delta R/R_{-1} = -2.273 + 0.090 D/H \Delta D/D_{-1} + 0.016 \Delta Y^r/Y^r_{-1} - 4.758 \Delta P/P_{-1} \\ + 23.407 \Delta \lambda/\lambda_{-1} + 0.186 \Delta i/i_{-1}$$

(-0.74) (0.89) (1.51) (-1.55) (0.91) (-0.32)

R² 0.189 DW 1.234 σ 9.719 OLSQ
 Stability Test Chow_{60-66,67-88} 1194.3 F_{critical} 2.77

4. Uddin (1985) Model

$$R/R + D \Delta R/R_{-1} = 0.001 (D/R + D \Delta D/D_{-1}) + 0.016 \Delta Y^r/Y^r_{-1} + 0.002 \Delta P/P_{-1} - 0.002 \Delta i/i_{-1}$$

(0.05) (0.15) (0.09) (-0.01)

R² 0.0001 DW 1.738 σ 0.529 OLSQ
 Stability Test Chow_{60-66,67-88} 45.62 F_{critical} 2.77

5. Connolly-Taylor (1976) Model

$$\Delta \Delta R/M = -0.132 \Delta \Delta e/e - 1 - 0.053 \Delta \Delta D/M$$

(-2.14) (-1.71)

R² 0.013 DW 1.762 σ 28.887 OLSQ
 Stability Test Chow_{60-66,67-88} 0.120 F_{critical} 3.42

6. Guitian (1976) Model

$$\Delta R = -0.020 \Delta D - 0.003 Y^n + 8.065 P - 4.124 P^*$$

(-0.21) (-0.02) (0.34) (-0.20)

R² 0.015 DW 1.982 σ 863.97 OLSQ
Stability Test Chow_{60-66,67-88} 0.003 F_{critical} 2.77

7. Edward (1979) Model

$$\ln R = -0.139 \Delta \ln M + 0.186 \ln Y^n + 0.765 \ln R_{-1}$$

(-0.76) (3.52) (10.76)

R² 0.920 DW 2.72 σ 0.643 OLSQ
Stability Test Chow_{60-66,67-88} 9.281 F_{critical} 2.77

8. Spanos-Taylor (1985) Model

$$\Delta R/R+D = 0.088 \Delta D/R+D + 0.192 \Delta \ln Y^r - 0.304 \Delta \ln P + 0.521 \Delta \ln \lambda - 0.034 \ln i$$

(0.28) (0.99) (-1.81) (0.55) (-0.16)

R² 0.126 DW 1.504 σ 0.422 OLSQ
Stability Test Chow_{60-66,67-88} 104.74 F_{critical} 2.77

$$\Delta R/H = 0.934 \Delta D/H + 12.286 \Delta \ln Y^r - 14.760 \Delta \ln P + 33.202 \Delta \ln \lambda - 1.289 \ln i$$

(0.24) (1.23) (-1.51) (0.57) (-0.09)

R² 0.078 DW 1.263 σ 24.640 OLSQ
Stability Test Chow_{60-66,67-88} 39873 F_{critical} 2.77

APPENDIX 6.3B

Replication of the Reserve Models to the Indonesian Data 1967-1988

1. Zecher-Genberg (1976) Model

$$R/H \Delta \ln R = -0.208(D/H \Delta \ln D + \Delta \ln \lambda) + 1.230 \Delta \ln Y^r + 0.885 \Delta \ln P - 0.111 \ln i$$

$\sqrt{(-1.65)} \qquad \qquad \qquad \sqrt{(3.16)} \qquad \qquad \sqrt{(2.30)} \qquad \qquad \sqrt{(-0.66)}$

R² 0.408 DW 1.978 σ 0.282 LF -0.515

OLSQ, Cochrane Orcutt

$$R/H(\Delta \ln R - \Delta \ln P) = -0.203 D/H \Delta \ln D + 1.320 \Delta \ln Y^r - 0.007 \Delta \ln \Pi - 0.799 \Delta \ln \lambda - 0.086 \Delta \ln i$$

$\sqrt{(-1.55)} \qquad \qquad \sqrt{(3.63)} \qquad \sqrt{(-0.13)} \qquad \sqrt{(-0.91)} \qquad \sqrt{(-0.50)}$

R² 0.483 DW 1.940 σ 0.279 LF -0.285

OLSQ, Cochrane Orcutt

$$R/H(\Delta \ln R - \Delta \ln P) = -0.212(D/H \Delta \ln D + \Delta \ln \lambda) + 1.270 \Delta \ln Y^r - 0.004 \Delta \ln \Pi - 0.109 \ln i$$

$\sqrt{(-2.00)} \qquad \qquad \qquad \sqrt{(3.61)} \qquad \sqrt{(-0.08)} \qquad \sqrt{(-0.63)}$

R² 0.469 DW 1.893 σ 0.283 LF -0.580

OLSQ

2. Bean (1976) Model

$$R/R+D \Delta \ln R = -0.130(D/R+D \Delta \ln D) + 0.387 \Delta \ln Y^r + 0.704 \Delta \ln P - 0.096 \Delta \ln \lambda - 0.040 \Delta \ln i$$

$\sqrt{(-.90)} \qquad \qquad \sqrt{(2.12)} \qquad \sqrt{(3.59)} \qquad \sqrt{(-0.31)} \qquad \sqrt{(-0.59)}$

R² 0.414 DW 2.120 σ 0.116 LF 19.652

OLSQ, Cochrane Orcutt

$$R/R+D \Delta \ln R = -0.122(D/R+D \Delta \ln D + \Delta \ln \lambda) + 0.377 \Delta \ln Y^r + 0.707 \Delta \ln P - 0.039 \Delta \ln i$$

$\sqrt{(-1.05)} \qquad \qquad \qquad \sqrt{(2.33)} \qquad \sqrt{(3.72)} \qquad \sqrt{(-.60)}$

R² 0.413 DW 2.129 σ 0.113- LF 19.646

OLSQ, Cochrane Orcutt

$$(R/R+D \Delta \ln R - \Delta \ln P) = -0.27(D/R+D \Delta \ln D + \Delta \ln \lambda) + 0.360 \Delta \ln Y^r - 0.041 \Delta \ln \Pi - 0.014 \Delta \ln i$$

$\sqrt{(-3.39)} \qquad \qquad \qquad \sqrt{(2.63)} \qquad \sqrt{(-2.00)} \qquad \sqrt{(-.21)}$

R² 0.361 DW 2.129 σ 0.113 LF 19.315

OLSQ

3. Uddin (1985) Model

$$R/R + D\Delta R/R_{-1} = 0.236 (D/R + D\Delta D/D_{-1} + \Delta\lambda/\lambda_{-1}) + 0.247 \Delta Y^r/Y^r_{-1}$$

$\times (0.97) \qquad \qquad \qquad \sqrt{(.56)}$

$$+ 0.978 \Delta P/P_{-1} - 0.19 \Delta i/i_{-1}$$

$\sqrt{(3.88)} \qquad \sqrt{(-1.19)}$

R² 0.527 DW 1.669 σ 0.363 LF -6.8567
OLSQ, Cochrane Orcutt

$$(R/R + D\Delta R/R_{-1} - \Delta P/P_{-1}) = -1.14 (D/R + D\Delta D/D_{-1} + \Delta\lambda/\lambda_{-1}) + 0.001 \Delta Y^r/Y^r_{-1}$$

$\sqrt{(-8.02)} \qquad \qquad \qquad \sqrt{(1.25)}$

$$+ 0.210 \Delta \Pi/\Pi_{-1} - 0.004 \Delta i/i_{-1}$$

$\times (0.43) \qquad \sqrt{(-0.11)}$

R² 0.773 DW 1.630 σ 0.713 LF -22.650
OLSQ

4. Connolly-Taylor (1976) Model

$$\Delta \Delta R/M = -0.053 \Delta \Delta D/M - 0.132 \Delta \Delta e/e_{-1}$$

$\sqrt{(-1.71)} \qquad \times (-2.14)$

R² 0.218 DW 2.801 σ 0.188
OLSQ

5. Guitian (1976) Model

$$\Delta R = -0.020 \Delta D - 0.001 Y^n + 9.290 P - 5.200 P^*$$

$\sqrt{(-0.18)} \quad \times (-0.03) \quad \sqrt{(0.20)} \quad \times (-0.13)$

R² 0.001 DW 1.982 σ 996.61
OLSQ

6. Edward (1979) Model

$$\ln R = -0.326 \Delta \ln M + 0.177 \ln Y^n + 0.787 \ln R_{-1}$$

$\sqrt{(-2.45)} \qquad \sqrt{(5.16)} \qquad \sqrt{(17.09)}$

R² 0.936 DW 2.380 σ 0.573
OLS, Cochrane Orcutt

7. Spanos-Taylor (1985) Model

$$\Delta R/R+D = -0.102 \Delta D/R+D + 0.276 \Delta \ln Y^r + 0.388 \Delta \ln P - 0.116 \Delta \ln \lambda - 0.027 \ln i$$

$\sqrt{(-1.13)} \quad \sqrt{(2.02)} \quad \sqrt{(2.81)} \quad \sqrt{(-0.49)} \quad \sqrt{(-0.53)}$

R² 0.285 DW 2.017 σ 0.089 LF 25.464

OLS, Cochrane Orcutt

$$\Delta R/R+D = -0.104 (\Delta D/R+D + \Delta \ln \lambda) + 0.277 \Delta \ln Y^r + 0.386 \Delta \ln P - 0.028 \ln i$$

$\sqrt{(-1.27)} \quad \sqrt{(2.17)} \quad \sqrt{(2.98)} \quad \sqrt{(-0.55)}$

R² 0.285 DW 2.020 σ 0.086 LF 25.462

OLSQ, Cochrane Orcutt

$$\Delta R/H = -0.108 \Delta D/H + 0.947 \Delta \ln Y^r + 0.890 \Delta \ln P - 0.374 \Delta \ln \lambda - 0.066 \ln i$$

$\sqrt{(-1.11)} \quad \sqrt{(2.57)} \quad \sqrt{(2.59)} \quad \sqrt{(-0.56)} \quad \sqrt{(-0.45)}$

R² 0.194 DW 1.882 σ 0.262 LF 1.068

OLSQ

$$\Delta R/H = -0.108 (\Delta D/H + \Delta \ln \lambda) + 0.908 \Delta \ln Y^r + 0.844 \Delta \ln P - 0.070 \ln i$$

$\sqrt{(-1.18)} \quad \sqrt{(2.56)} \quad \sqrt{(2.63)} \quad \sqrt{(-0.48)}$

R² 0.189 DW 1.893 σ 0.255 LF 1.025

OLSQ, Cochrane Orcutt

APPENDIX 6.3C

**Alternative Estimate of the AK Model, 1974-1988
for the Equation 6.3.1.9 - Regressand $RH^{-1}\Delta R$**

Regressors	Estimated Coefficients	t - Ratios	Partial Correlation
Constant	0.956	2.40	0.732
$\Delta P/P-1$	3.749	2.49	0.744
$\Delta i/i-1$	-1.753	-4.27*	-0.886
$\Delta Y_r/Y_r-1$	-3.957	-1.88	-0.790
$\Delta \Pi/\Pi-1$	0.895	6.11*	0.939
$DH^{-1}\Delta D/D1+\Delta \lambda/\lambda-1$	-1.285	-3.31	-0.829
time	-0.022	-1.17	-0.464
$\sigma=0.1966$	Ftable 4.14=8.67	DW=2.650	Adj.R ² =0.747

6.4. THE CAPITAL MARKET APPROACH TO THE BALANCE OF PAYMENTS (THE CAPITAL MODEL)

In recent years, the occurrence of "capital flight" ¹ in Indonesia has been more evident and the subject of analysis by Mahyuddin (1989). Using Cuddington (1986) model, Mahyuddin found that capital flight from Indonesia was induced by financial crisis and high inflation. This section differs from Mahyuddin in the following manner, firstly, the study period covers 1960-1988, secondly, it employs a general equilibrium analysis by incorporating financial flows into a macroeconomic model of an open economy. This section is useful for policy makers since capital flight in developing countries could cause an increase of foreign debt and a decrease in domestic investment (Khan-Nadeem 1985). Moreover a huge amount of capital flight can be viewed as an indication of a country's predicament in financing international payments. Estimates of capital flight in fact are commonly used in lending decisions made by international banks to developing countries.

The major aim of this section is to examine the CMABP hypothesis with special reference to the relationship between the "offset coefficient" ² and the capital flows during 1960-1988. It is organized into two parts. Part 6.4.1 briefly explains the methodology used to derive the portfolio-balance model which provides the basis for testing the CMABP hypothesis. Part 6.4.2 presents empirical results and conclusions which

¹Capital flight in this study refers to short-term capital outflows.

²Offset coefficient is the coefficient of domestic credit or of current-account balance in the portfolio-balance model.

about the determinants of capital movements in Indonesia identified by the econometric analysis. (Data and sources are provided in chapter 5).

6.4.1. Methodology

The Capital Market Approach to the Balance of Payments (CMABP), known as the portfolio-balance model in the monetary literature, originated with Kouri-Porter (1974). It is a synthesis of the Branson (1968) model of portfolio selection and the Monetary Approach to the Balance of Payments theory developed by Mundell (1968) and Johnson (1972). This model has general equilibrium properties since capital movements are examined in the context of the overall balance of payments and the effect of foreign exchange flows is also considered. Kouri and Porter further asserted that the only balance-of-payments transactions caused by an excess money demand is an inflow of private capital, while an excess money supply creates an outflow. Thus, the CMABP hypothesis does not focus its attention on just one asset, namely money. It recognizes that the demand for and supply of not only money but also all other assets (assuming all other assets to be perfect substitutes) have to be taken into account in analyzing the balance of payments. It views asset movements as a mechanism for eliminating excess supply of or demand for money. Consequently the balance of payments disequilibrium may follow from changed supply or demand conditions for foreign and domestic assets as well as changes in money-market conditions; the balance of payments equilibrium is a result of a range of prices that equalizes the demand for and supply of the broad spectrum of all assets which comprise monies and wealth portfolios in the economy.

The CMABP ³ hypothesis propounds that the flow of capital in the economy occurs via adjustments in the financial sectors which consist of four functions, namely the demand for base money, the demand for domestic assets, the demand for world assets, and the world demand for domestic assets. The real sector of the economy is assumed to be exogenous, so changes in income and in current account are exogenously determined. The assumption of perfect capital mobility causes the demand and the supply equations of the asset market model to drop out. Subsequently the model is condensed into a monetary model of an open economy.

The CMABP theory states that the demand for money in the economy is specified as a function of world interest rate (i^*) ⁴, income (Y^n), wealth (W) and the difference between the expected exchange rate and the spot rate ($\rho = \xi^e - \xi$) as follows

$$M^d = \Phi(i^*, Y^n, W, \rho) \quad 6.4.1.1$$

$$M^s = D + F \quad 6.4.1.2$$

$$\Delta F = K + CB \quad 6.4.1.3$$

where the equations 6.4.1.2 and 6.4.1.3 are economic identities; they indicate the components of the supply of base money and the change in net world assets. Equilibrium in the money market implies

³The CMABP approach assumes that (1) changes in income, prices, and the stock of wealth are exogenously given, (2) monetary factors are not permitted to influence the real variable: neutral monetary policy, (3) changes in real variables and domestic component of the monetary base will cause portfolio substitutions which lead to capital flows and changes in domestic interest rate, (4) there are only three types of financial assets in the economy, namely, base money, domestic and foreign assets, (5) expectations regarding price level and exchange rate are stationary, (6) domestic economy is small such that the world supply of world assets is infinitely elastic at the foreign interest rate, and (7) there is a perfect capital mobility among countries.

⁴There has been unending disputes in the monetary literature regarding the demand for money which is specified as a function of world interest rate (Vane-Thompson 1979).

$$M^d = M^s$$

6.4.1.4

By first-differencing equation 6.4.1.1, 6.4.1.2, 6.4.1.4 and substituting equation 6.4.1.3, then solving the equations for capital movement as a regressand, it produces the empirical model of the CMABP hypothesis ⁵ previously developed in chapter 3.4 as follows ⁶

$$K = \tau_{10} + \tau_{11} i^* + \tau_{12} \Delta Y^n + \tau_{13} \Delta D + \tau_{14} CB + v_{10}$$

6.4.1.5 ⁷

The above equation contains the fundamental argument of the CMABP hypothesis whereby the testable ⁸ explanatory variables in the model are changes in domestic income, the current balance, changes in domestic monetary instruments, and changes in world interest rate.

⁵In the empirical literature, the interest rate coefficient is determined empirically (Krein-Officer 1978). Some studies used Δi^* , some studies employed Δi , and others used (i^*-i) for the coefficient (Taylor 1990). The other measures of interest rate coefficient such as the variables of (i^*-i) , $\Delta(i^*-i)$, Δi^* , Δi , and i were tried in this study without success (wrongly signed and insignificant). After some experimentation, i^* was used as the explanatory variable.

⁶As explained previously, the justification for inserting the current balance in the Capital model is due to the fact that the current balance affects capital flow since it is an autonomous source of change in the monetary base.

⁷A constant term was added to account for the fact that the "true" model may not be linear and for the fact that since the variables of wealth and world income are eliminated from the empirical model, it is reasonable to assume that the elimination of these variables will not affect the final result (since it will be reflected in the constant terms).

⁸Testable here means observable. While theoretical structure of the model is well-established, a number of problems are encountered when the variables are translated into observable data. Several variables such as differential risk, expected rate-of-return and expected exchange-rate are not immediately observable (see Llewellyn 1980). Not to mention, the lack of data on the domestic and world wealth.

A major problem in the empirical analysis of capital movements is the proper specification of a risk factor. In a system of floating rates, exchange-rate risk and speculation may be estimated directly by adopting a model of expectation formation as central to the explanation of equilibrium in the balance of payments. However in a pegged-rate system like Indonesia, this would be implausible since the model would determine forward exchange rates; the forward exchange rate itself is pegged and determined by the Authorities! This formation of exchange-rate expectation which incorporates an intervention band is particularly difficult to formulate in an econometric model so as to have empirical applicability. For example Kesseiman (1971) and Artus (1976) attempted to estimate the exchange-rate expectation function but they had little success. There are a number of difficulties in deriving a testable expectation hypothesis that could describe the behaviour of speculators in the system of fixed parities. Usually in the first case the exchange-rate expectation variable is dropped by imposing the assumption of static expectation (footnote 3). In the second case, the exchange-rate expectation variable may be substituted by a proxy variable. Thus, instead of incorporating a specific model of expectation formation, actual exchange-rate changes (6.4.1.6) or dummy ⁹ (6.4.1.7) variable may be used as proxy measures of risk and speculative activity. Exchange-rate changes may be used as a proxy because a change in exchange rate or devaluation would lead to capital outflows by investors (in search of lower risks and speculative activity) due to the fear of further devaluation.

$$K = \tau_{20} + \tau_{21} i^* + \tau_{22} \Delta Y^n + \tau_{23} \Delta D + \tau_{24} CB + \tau_{25} \Delta \xi + u_{20} \quad 6.4.1.6$$

$$K = \tau_{30} + \tau_{31} i^* + \tau_{32} \Delta Y^n + \tau_{33} \Delta D + \tau_{34} CB + \tau_{35} \text{Dummy} + u_{30} \quad 6.4.1.7$$

⁹The difference between expected and actual exchange rates may be substituted by dummy variables. The dummy variable is assigned to be positive in the case of speculative capital inflows and negative in the case of speculative outflows.

where the priors for the expected signs are as follows, $\tau_{11,21,31} < 0$, $\tau_{12,22,32} > 0$, $\tau_{13,14,23,33,24,34} < 0$, $\tau_{25} < 0$, and $\tau_{35} > 0$. An increase of foreign interest rate will decrease the inflow of capital and as long as foreign rates remain high relative to domestic rates the decreased inflow would continue. An increase in domestic income will decrease the demand for bonds since it raises the demand for money which is partially fulfilled by an increased inflow of capital. There is a negative association between private capital inflows and domestic credit or current balance. The offset coefficient is expected to vary, from zero to unity, according to the degree of capital mobility. When the coefficient equals one, there is perfect capital mobility. A reduction in the nominal value of domestic currency, devaluation for example, would stimulate capital flight. Equation 6.4.1.5, 6.4.1.6 and 6.4.1.7 can be used to simulate macro policy advice since it contains the instruments of monetary policy as regressors.

To test the hypothesis of the sterilization coefficient being equal to minus unity, a sterilization equation ¹⁰ is required in which domestic credit creation is the dependent variable and private capital inflow is an explanatory variable as follows

$$\Delta D = \theta_0 + \theta_1 K \quad 6.4.1.8$$

where $\theta_1 < 0$ implies partial sterilization while $\theta_1 = -1$ implies complete sterilization.

To test for structural change in the Capital model, the CUSUMSQ test and the Chow test will be employed. Structural change here means the stability of the parameter coefficients of the model over the whole period 1960-1988; the capital flow is said to increase if parameters are changing so as to

¹⁰In the monetary literature, this sterilization equation is known as the reaction function. It is meant to underscore that the ΔD coefficient is the only parameter of interest for examining the CMABP hypothesis.

reflect increase in the responsiveness of the capital flow to given changes in the explanatory variables. The CUSUMSQ test is utilized since a possible break point of the model is not known *a priori*. The CUSUMSQ is defined as the total of the squared recursive residuals normalised by their standard errors for the full period, algebraically as follows

$$\text{CUSUMSQ} = \left(\sum_{i=k+1}^t w_i^2 \right) \left(\sum_{j=k+1}^n w_j^2 \right)^{-1} = (\text{RSS}_t) (\text{RSS}_n)^{-1} \quad 6.4.1.9$$

where w stands for the standardized recursive residuals, RSS for the residual sum of squares, subscript t for the duration of the t period, and subscript n for the whole period.

As a final check for comparison, the Chow test is computed as

$$F = (n_1 + n_2 - 2k) \{ \text{RSS}_3 - (\text{RSS}_1 - \text{RSS}_2) \} (k)^{-1} (\text{RSS}_1 - \text{RSS}_2)^{-1} \quad 6.4.1.10$$

with $\text{df} = k$, $n_1 + n_2 - 2k$ where df stands for the degree of freedom, n for number observations, subscript 1 for the period 1960-1977, subscript 2 for the period 1978-1988, subscript 3 for the period 1960-1988, and k for number of parameters.

6.4.2. Empirical Results

All statistical inferences are based on 95 per cent confidence intervals. The Capital model (6.4.1.5) estimated by Ordinary Least Squares for the whole period 1960-1988 is presented as follows

$$K = 641.052 - 0.038\Delta D - 113.823 i^* - 0.025CB + 0.002\Delta Y^n \quad 6.4.2.1$$

(4.42) (-0.51) (-2.82) (-0.30) (0.10)

$$R^2 = 0.38 \quad \text{DW}(d) = 2.25 \quad F = 3.56 \quad \sigma = 547.66 \quad \text{ML} = -213.53$$

It seems that the model 6.4.1.5 has to be reformulated by including a risk factor. This is supported by the fact that the Ramsey's RESET test of specification error reveals an F value that is highly significant (=10.15) so is the constant term (t=4.42) indicating that the model is misspecified and there were significant omitted variables that should have been included. Relaxing the assumption regarding static expectations (footnote 3) and adding exchange-rate changes as an additional explanatory variable (6.4.1.6), it yields the model 6.4.2.2 as follows

$$K = 1760.700 - 0.128 \Delta D - 126.972 i^* - 0.063 CB \\ (2.72) \quad (-2.00) \quad (-3.10) \quad (-1.03) \\ - 0.060 \Delta Y^m - 3.970 \Delta \xi \quad 6.4.2.2 \\ (-2.33) \quad (-3.57) \\ R^2 = 0.63 \quad DW(d) = 1.80 \quad F = 4.38 \quad \sigma = 478.22 \quad ML = -192.53 \quad Chow_{60-77,78-88} = 9.43$$

Regression 6.4.2.2 seems to fit the data better as indicated by its statistical performances ¹¹. The signs of the explanatory variables were all in line with the theoretical expectation except the sign on income variables. It is theorized that the income coefficient should be positive; an increase in income would increase the demand for money which partially satisfied by inflows of capital. Contrastingly this negative value of the income coefficient (= -0.060) implies that an increase in domestic income would lead to the purchase of foreign assets by residents thereby deteriorating balance of payments.

To test for structural stability, the CUSUMSQ test was employed. The test was indicative of a lack of stability in the model 6.4.2.2 during the whole period of 1960-1988. The test indicates no sign of instability up to 1976-1977 but after 1977

¹¹ The robustness of the exchange-rate variable is supported by the fact that the dummy variable is significant (t=3.41) indicating the existence of speculative capital movements due to exchange-rate changes.

$$K = 504.890 - 0.001 \Delta D - 91.033 i^* - 0.001 CB - 0.001 \Delta Y^m - 310.400 \text{ Dummy} \\ (2.27) \quad (-0.17) \quad (-2.67) \quad (-0.02) \quad (-0.05) \quad (3.41) \\ R^2 = 0.60 \quad DW(d) = 2.21 \quad F = 6.48 \quad \sigma = 453.10 \quad ML = -207.60$$

the CUSUMSQ shows a definite downward movement (appendix 6.4A). As a final check, the Chow test was computed. The Chow test agrees with the CUSUMSQ test ¹² in suggesting that the parameters are not constant across the full 29 years, 1960-1988. Splitting the sample into into two periods 1960-1977 and 1978-1988, it yields the results in table 6.4.2.1.

Table 6.4.2.1
The Capital Models for 60-88, 60-77, 78-88

Regressors	1960-1988	1960-1977	1978-1988
Constant	1760.700	-38.038	4195.700
(t)	(2.72)	(-0.55)	(6.19)
ΔD	-0.128	0.159	-0.337
(t)	(-2.00)	(3.25)	(-3.70)
CB	0.063	-0.029	-0.024
(t)	(1.03)	(-4.53)	(-0.46)
i*	-126.973	0.234	-352.896
(t)	(-3.10)	(0.17)	(-5.37)
ΔY ⁿ	-0.060	-0.034	-0.019
(t)	(-2.33)	(-2.23)	(-0.55)
Δξ	-3.97	-0.200	-4.783
(t)	(-3.57)	(-0.38)	(-4.14)
R ²	0.63	0.82	0.95
DW (d)	1.80	2.06	2.90
F	4.38	10.13	10.77
σ	478.22	80.36	351.33

¹²Theoretically it is expected that the tests reach the same conclusion since the CUSUMSQ test can be defined as a particular form of the Chow test or algebraically as follows

Chow = $\frac{1}{n} \left(\frac{CUSUMSQ}{T1-K} \right)^{-1} - 1$ where CUSUMSQ is defined as the total of the squared recursive residuals normalised by their standard errors for the full period, n as the number of the whole-period observation, T1 as the number of the first-period observation, and K as the number of regressors.

A detailed examination of the two regression results (1960-1977 and 1978-1988) suggests a shift in the the parameter after 1977 marked by the changes in the magnitude and in the significance of the explanatory variables. This shift might be due to the effect of the 1965 revolution and the economic liberalization which created greater opportunities for capital mobility in and out of the country. The implication is that experience of capital mobility led to an essential change in the behaviour of economic agents in the economy as reflected by the CUSUMSQ test that the underlying parameter vectors have been changed. At the 5 percent level the critical value is less than the CUSUMSQ (0.017). There was a substantial shift in the degree of capital mobility since the offset coefficient of domestic credit varied significantly from +0.159 to -0.337 over the sample period. In the first period 1960-1977 the domestic credit coefficient was surprisingly positive and significant (a decrease in the domestic credit was associated with the capital outflow) whereas in the later period 1978-1988 it was negative and significant. This result might be due to the fact that during the transition period 1960-1970, the Authorities undertook tight monetary policy to combat for hyperinflation which caused a decrease in the domestic credit creation, whilst at the same time the economy experienced several devaluations to correct deficits which caused a huge amount of capital outflows; investors transferred their capital abroad in search of lower risk and business speculations due to rupiah instability. This decrease in the domestic credit and the rise in the capital outflows may explain the positive association between the capital inflow and the domestic credit coefficients during the first period. Whereas in the later period 1978-1988, changes in the domestic component of the base money are offset by induced capital movements ($t=-3.70$). Since there is a significant response of capital movements to changes in the money supply, the Authorities therefore may utilize monetary policy to stimulate inflows of capital. The other explanatory variables varied considerably over the

sample period. The structural change that materialized in 1977 appeared to have considerably altered the effects of all explanatory variables (table 6.4.2.1). The changes may have been caused by several factors such as the rise in the level of international trade and multinational activity, and particularly the rapid growth of financial markets during 1980s notably the Jakarta and Surabaya Stock Exchanges.

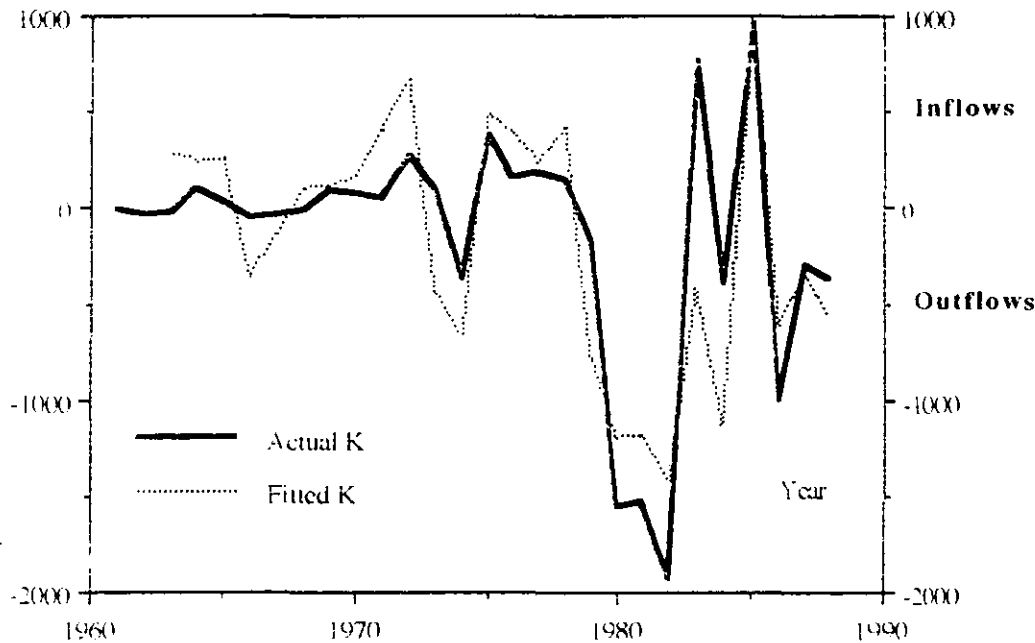
The behaviour of the actual and fitted values of the model 6.4.2.2 for the period 1960-1988 is illustrated in graph 6.4.2.1. The graph shows that negative residuals, as an indication of uncaptured capital outflows by the model peaked in the years 1980, 1981 and 1982. These outflows might be caused by the purchase of foreign assets by domestic residents particularly after the post-liberalization period 1978 which liberalized the channels to foreign asset markets.

Repeated devaluations may also have offered the opportunity for speculative activity. From 1960 to 1968, there were consistent outflows of capital due to the economic chaos (hyperinflation and rupiah instability) before the 1966 revolution. Conversely the corresponding rise in the capital inflows occurs in after 1968 particularly in the years 1972, 1975, 1983 and 1985. One plausible explanation is that foreign investors were increasing the fraction of the portfolio they held in domestic bonds, more investments materialized as a result of increasing foreign knowledge of domestic investment possibilities and increasing the mobility of foreign funds, particularly after the enactment of the 1968 Foreign Investment Law.

During 1960-1977, the model appears to fit the data well as indicated by the statistics. However, the sign on the domestic credit and income variables were not in accordance with theoretical expectations. It is theorized that both offset coefficients of domestic credit and current balance should be similar and negative approaching minus one. It seems that

private capital flows financed deficits or surpluses on the current balance during 1960-1977, since the offset coefficient on the current balance was significant. This conforms to the CMABP theory. A striking feature of the model was that the income coefficient is found to be negative and significant implying that higher income lead to capital outflows. This was not in favour with the CMABP hypothesis.

Graph 6.4.2.1
Actual and Fitted Values



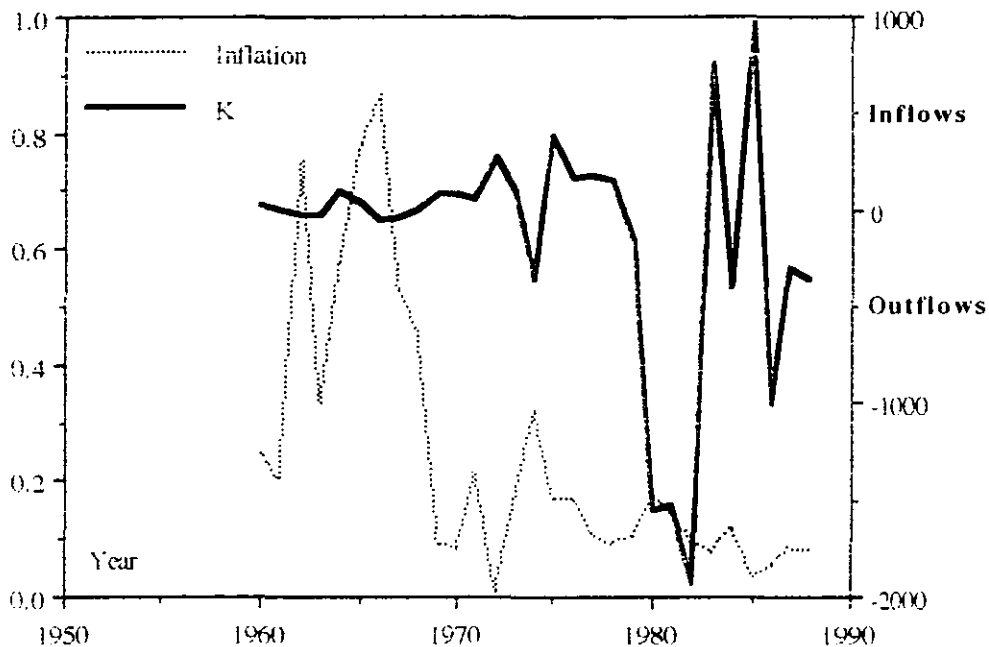
During 1978-1988, most parameter coefficients were significantly different from zero with the exception of the current balance and income variables. The world interest rate coefficient i^* is negative and significant. This result is in accordance with the "capital flow" theory which states that an increase of the world interest rate would reduce the inflow, and as long as the world interest rate continued high relative

to domestic interest rate ¹³, the decreased inflow would continue (Branson 1971). Accordingly a deficit on the balance of payments may have been corrected by raising the domestic interest rate relative to the world interest rate: as long as the domestic interest rates continued high relative to the world rates, the capital outflows would continue to decline. The coefficient on the foreign interest rate was significant for 1960-1988 and 1978-1988 but was not significant for 1960-1977. The finding also indicates that capital flows underwent a significant structural change, and the instability of the capital flow may partially have been due to changes in interest sensitivity over time and to changes in the nature of speculation. This interest rate sensitivity in some countries is supported by the work of Branson (1971). During 1978-1988 the movement of capital was also significantly "explained" by exchange-rate changes ($t=-4.14$), whilst in the earlier period 1960-1977 the flows were attributed to other factors such as political crises and high inflation rate (graph 6.4.2.2) since the exchange-rate variable was not significant ($t=-0.38$).

Graph 6.4.2.1 and 6.4.2.2 also reveals that Indonesia experienced not only capital flight but also two-way flows of capital; inflows and outflows. Before 1968, capital flight in the economy occurred due to political instability; *G30S/PKI*, the 1965 Revolution and the government transition from the *Orde-Lama* to the *Order-Baru*. The period was characterized by economic chaos; high inflation rate and domestic financial crises. Graph 6.4.2.2 shows that high inflation rates were associated with capital outflows.

¹³On the same line, Kenen (1963) argues that capital flows also correlated with the level of interest-rate differentials (i^*-i), although Tobin (1963) asserts that it is rising, not high interest rates, that caused an increased capital flow.

Graph 6.4.2.2
Capital Flows and Inflation 1960-1988



During 1969-1979, a huge amount of capital flows into the country. At that period, the balance of payments was favourable. In addition, high domestic interest rate instituted during the period attracted huge inflows of capital; this result is in line with Rosendale (1981). The inflows reached peaks in 1972 and 1975. In those years Indonesia began to accumulate foreign exchange reserves. By contrast, after 1979 capital outflows were prevalent in the economy. The outflows of capital after 1979 particularly in 1980, 1981 and 1982 were not caused by political instability as were those in the earlier period but because of the the fear of devaluation due to the weak performance of the domestic production. At that time oil prices slumped, world demand stagnated, and the performance of the non-oil was not outstanding. The large devaluation in 1978 would add to inflationary pressures in the following years. In fact in 1981-1982 Indonesia experienced the biggest budget deficit in a decade (Sundrum 1988). This growing

probability of a large currency devaluation and the budget deficit as a sign of economic crisis undoubtedly contributed to the shift of domestic wealth into foreign assets. This view is supported by Mahyuddin (1988) that the capital flight in Indonesia was partially caused by financial repression.

Previous empirical studies in industrialized countries regarding the sterilization coefficient indicated that partial sterilization was normal policy during the years 1950-1966, with the monetary authorities increasing the domestic credit in response to an inflow of capital (Michaelly 1971). Since the results 6.4.2.3, 6.4.2.4 and 6.4.2.5 below reveal that the reaction functions were not all significant, sterilization of private capital flow does not seem to have been present in the economy. Sterilization to some extent depends on the degree of bond substitutability and capital mobility. Since the conditions of capital mobility and bond substitutability were not satisfied in the Indonesian economy, it is plausible that the coefficient were not equal to minus unity.

1960-1977	$\Delta D = 379.214 + 1.827 K$ (2.39) (1.67)	6.4.2.3
1978-1988	$\Delta D = 436.454 + 0.789 K$ (0.43) (-0.79)	6.4.2.4
1960-1988	$\Delta D = 373.808 - 0.796 K$ (1.23) (-1.68)	6.4.2.5

From the results, several important findings emerge as follows

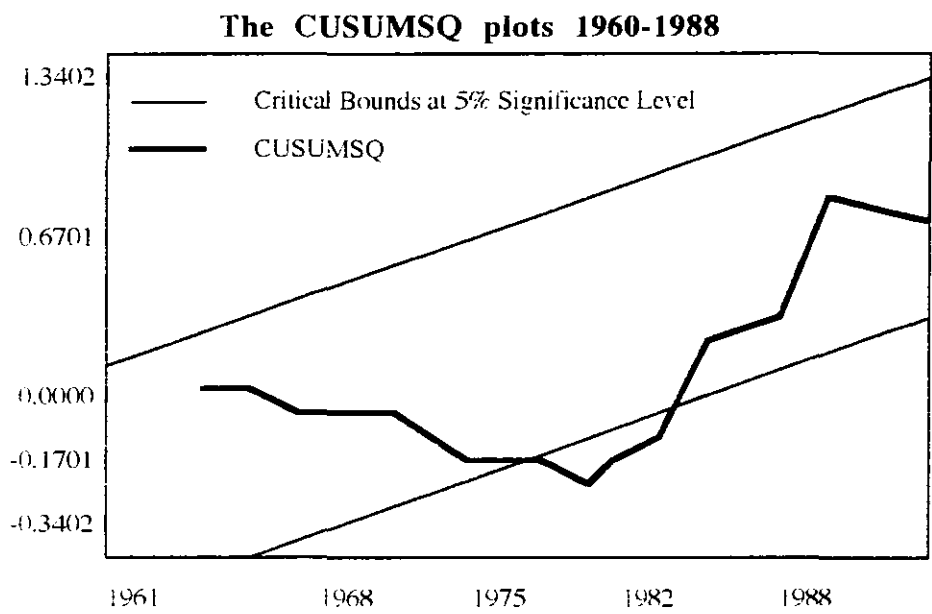
- This study examines the pattern of capital movements in the Indonesian economy by using the portfolio-balance model. The results indicate that capital flight was an important phenomenon in Indonesia before 1968 and after 1979. Between 1969-1978, however, capital inflows were observed. The analysis reveals that there is a complex array of factors which cause capital flight. It seems that political chaos, change in government regime, high inflationary economy, fiscal deficits,

the fear of devaluation and high world interest rate were the primary causes of capital flight; the capital flight materialized because investors transferred their capital abroad in search of lower risks, higher return and safety considerations. Moreover the relative openness of the financial market facilitated capital flight by residents who lacked confidence in the domestic financial market. Whereas capital inflows were associated with high domestic interest rates during the stabilization period.

•The study also reveals unstable relationships between movements in capital flows and world interest rates, current balance, changes in domestic credit, changes in domestic income, and changes in exchange-rate. The changes in the nature of capital movements might be due to the liberalization of the financial market and the economy after the 1965 revolution. After the structural break in 1977, the overall explanatory power of the model performance had changed considerably, for example an increase in the world interest rate and increased expectation of devaluation would motivate capital outflows before exchange rate changes. In addition an increase in the domestic credit or the monetary base would be significantly offset by an outflow of capital. Although the model explains significantly the capital movements in Indonesia for the period 1960-1988, the estimates of the equation for all periods do not appear to be consistent with the CMABP hypothesis in terms of the expected sign, particularly the coefficients on domestic credit and income. The negative value of the income coefficient for example implies that economic growth associated with capital outflows contributed to the deterioration of the balance of payments. This is not in line with the CMABP hypothesis itself. Capital controls in this case may have restricted capital flight in the short-term, however, it may not have succeeded in redirecting domestic saving from domestic investment since the disequilibrium in the country creates strong incentives for capital flight. The

Indonesian government should try to change existing incentives in the economy for example by liberalizing capital imports, reforming domestic financial intermediation to make it less dependent on government intervention, maintaining relatively high interest rate, targeting domestic credit expansion and reforming tax-exemption to place funds in Indonesia, thus direct domestic and foreign resources toward expanding the economy. Nevertheless without a fundamental attack on the roots of economic and political instability, there is not much that can be accomplished by such a policy.

APPENDIX 6.4A



CHAPTER 7

OVERALL PERFORMANCE OF THE MODELS 1967-1988 ¹

Five approaches to modelling different aspects of the balance of payments, namely the Elasticities Approach to the Balance of Payments (EABP), the Absorption Approach to the Balance of Payments (AABP), the Monetary Approach to the Balance of Payments (MABP), the Capital Market Approach to the Balance of Payments (CMABP) and the Structural Approach to the Balance of Payments (SABP) have been investigated in the earlier chapters. These models differ fundamentally in their theoretical analysis, empirical conclusions, and the policy issues they support. They can potentially be used for a wide variety of purposes. This may include analysing the causes of Indonesia's balance of payments problems, simulating the effects of changes in policy and forecasting the various components of the balance of payments. It is unlikely that there will be one approach that "best" fits all of these uses and indeed the different models do in some sense complement each other as they analyze different elements of the balance of payments.

Individual estimates of these balance of payments models using single-equation techniques have received considerable attention in the literature. Early studies on the balance of payments models in developing countries concentrated on the Reserve model (chapter 4). However overall assessment and

¹To make comparison among alternative balance of payments models and their forecasting ability for the same period, the balance of payments models were re-estimated for the period of 1967-1988 during the period of the *Orde Baru* Government.

discrimination among the models have not been fully addressed in a rigorous manner. This thesis will therefore be concluded by assessing the overall performance of the various balance of payments models mentioned above. Since some of the models may well belong to a system of simultaneous equations (Genberg 1976, Laskar 1983), simultaneous equation techniques will also be applied to each model to assess the performance of the single estimation procedures discussed earlier in chapter 6.

This chapter is arranged into five sections. Section 7.1 discusses some criteria for assessing the balance of payments models. Section 7.2 assesses the explanatory power, theoretical plausibility, and accuracy of coefficients of the models. Section 7.3 discusses the use of the models for policy analysis whilst section 7.4 covers the forecasting capability of the models. Finally section 7.5 provides a summary and conclusions.

7.1. Criteria for Assessing the Balance of Payments Models

Various theories have been offered and investigated empirically for the balance of payments. These comprises of two main groups. First, the Elasticities, Absorption and Structuralist theories ² of the balance of payments which focus on current transactions of the balance of payments. Second, the Monetary and Capital Market theories of the balance of payments which emphasizes the importance of the financial side of the balance of payments. The theories cannot be tested

²In this study, the word "theory" and "model" are used interchangeably. Although Hendry-Wallis (1984) distinguish a theory from a model. They further argue that most theories leave unanswered a number of questions that arise in the transition to a model; a model or maintained hypothesis is never more than an approximation to the way variables under theory are determined.

directly because they involve theoretical concepts which are not observable, consequently the theories will be tested indirectly through models. The predictions yielded by such a model can provide an indirect test of that theory (Neal-Shone 1976).

The aim of this section is to present several criteria to be used in evaluating the alternative balance of payments models. The evaluation comprises of deciding whether the parameter estimates are theoretically valid and statistically satisfactory. Since the study is to provide the Indonesian government with both a forecasting tool and model to analyze policy prescriptions for correcting balance of payments disequilibrium, it is required therefore to choose criteria for distinguishing "good" models from "bad" ones. There are several potential criteria ³ in the econometric literature against which the balance of payments models will be assessed directly (Christ 1966), for example by judging :

Explanatory ability, i.e. the models should be able to explain the past behaviour of the balance of payments variables and to give an indication of the causes of balance of payments disequilibria. This assessment is to establish whether the theories can explain the actual balance of payments behaviour (whether the theories are compatible with the facts and whether the causes of this behaviour can be determined). If the theories are able to explain balance of payments behaviour, the theories will be accepted as "sound" theories.

Theoretical plausibility, i.e. the models should be compatible with the balance of payments theories. They should

³Several auxiliary criteria that are commonly advocated to assess an empirical model in the literature are (1) parsimony, to explain a lot by a little, (2) robustness, to be designed as far as possible to be protected against changes in features excluded from their formulations, (3) replication of results, to yield the same or similar results by different researchers (Hendry-Wallis 1984).

be consistent with the relevant parts of economic theory in terms of *a priori* view of signs and magnitude of parameters coefficients. Other aspects of theory consistency may be testable ⁴ when the coefficients are significantly different from the values predicted by the balance of payments theories. If the parameters coefficients are theoretically plausible and in accordance with the balance of payments facts, the models will be approved as valid on the basis of the *a priori* criteria.

Accuracy of coefficients, i.e. the value of the coefficients of the balance of payments models should be accurate and significant in order to see the effects of control or policy variables on the balance of payments fluctuations. However this statistical criterion is secondary only to the theoretical-plausibility criterion ⁵. It also should be able to explain the results obtained by previous researchers using the same or similar data set and explain why the method led to such conclusions. This stage of testing hypotheses is not done just to improve model specification but also to test the validity of the balance of payments theories. Finally the parameters estimates should possess the desirable properties of unbiasedness, consistency, and efficiency as shown by their diagnostic tests. If the models analyze the balance of payments phenomena accurately then this may be taken as supportive evidence to authenticate the balance of payments theories.

Applicability to policy making, i.e the models may be capable of application by the Indonesian authority for the analysis of policy responses to balance of payments problems. For example the decision of the Indonesian government

⁴Accompanying this methodological approach, the models will also be tested by different regression techniques since some models are hypothesized to belong a system of simultaneous equations.

⁵It means that the models should be rejected if they happen to have the "wrong" sign even though the parameters are statistically significant unless there is a "strong" reason to believe that the theory does not hold: it is not due to the deficiency in data (Johnston 1962).

of the currency will depend on the numerical values of the price elasticities of exports and imports. Such examples show the importance of the knowledge of the magnitude of parameter coefficients: it is an essential tool for the formulation of macroeconomic policy.

Forecasting ability, i.e. the model may be assessed by evaluating the forecasting power of the model. Friedman (1953) stated that the only relevant test of the validity of a theory is comparison of its predictions with experience; how closely each endogenous variable tracks its corresponding historical balance of payments behaviour or to describe the relative past. The fit of the models should not deviate from the observed data systematically. Although frequently it is evident that a model may give accurate forecasts even though its underlying economic theory is not well understood (Klein 1953). The estimated model then can be used to make conditional forecasts of the future of the balance of payments, to simulate the consequences of alternative economic policies on the balance of payments, and to search for an optimal way of controlling certain balance of payments targets through manipulation of certain policy instruments. If the models yield "poor" forecasting performances the models may then have to be rejected for forecasting purposes or may have to be modified given that they cannot replicate their estimation performance outside the estimation period ⁶.

Simplicity, i.e. the models should represent the economic relationship with maximum simplicity, the simpler the mathematical form of the models the better the models may be considered (Theil 1971).

⁶However if a model forecasts adequately, it does not mean that the model must be correct one since satisfactory forecasting power is only one of the prerequisite of the true model (Theil 1974).

In a nutshell, the concept of a robust model is one which describes the historical data without producing systematic misfit, has valid exogenous variables, fits equally well to the future, is consistent with the relevant balance of payments theory, may account for alternative explanations of the same set of data, and explain some new balance of payments phenomena that the alternative balance of payments models cannot. If the criteria are fulfilled, the theories will stand. While if they are not satisfied the theory may either be rejected or reformulated for particular purposes ⁷.

7.2. Explanatory Power, Theoretical Plausibility and Accuracy of Coefficients of the Balance of Payments Models

The main criteria for selecting reported models are their expected signs, significance, and diagnostic tests. All statistical inferences are based on a 95% confidence interval. Diagnostic statistics of single and simultaneous estimation results of the Elasticities, Absorption, Reserve and Capital models are presented in appendix 7A, 7B, 7C, and 7D respectively. However detailed treatments of the single-estimation procedures are reported in chapter 6.

⁷Hendry-Wallis (1984) argues that those criteria of assessing model is necessary but not sufficient. They further says that the failure on any one criterion reveals a direction of inadequacy whereas satisfying all the criteria does not guarantee that the model is adequate for some as yet unspecified purposes.

7.2.1. The Elasticities Model

As previously analyzed in chapter 3 and 4, the Elasticities approach to the analysis of balance of payments adjustment is based on the Marshall-Lerner condition. The Marshall-Lerner condition says that devaluation will improve trade balance if $\psi_{11} + \psi_{21} > 1$, where ψ_{11} and ψ_{21} are price elasticities of demand for exports and imports respectively. The elasticity coefficients ψ_{11} and ψ_{21} may be estimated from imports ⁸ and exports functions ⁹ as follows

$$x = \psi_{10} + \psi_{11} p^{EX} + \psi_{12} y^{W} \quad 7.2.1.1$$

$$m = \psi_{20} + \psi_{21} p^{IM} + \psi_{22} y^I \quad 7.2.1.2$$

where ψ_{12} and ψ_{22} are world income elasticity of demand for exports and domestic income elasticity of demand for imports. The expected signs of the Elasticities model ¹⁰ are as follows $\psi_{11} < 0$, $\psi_{21} < 0$ and $\psi_{22} > 0$, but the sign of world income elasticity of demand for exports, ψ_{12} , is ambiguous (Khan 1974).

The results show that estimated price elasticities of export demand are between -0.22 and -0.45, while those for imports are between -0.58 and -0.68. It indicates that Indonesia has relatively low price elasticity of demand for exports and imports. Although the necessary condition of the Marshall-Lerner theory is more or less satisfied, however, firstly, the sum of these price elasticities is not substantially greater than one ($-0.80 < \eta_x + \eta_m < -1.13$), secondly, the sufficient condition

⁸It is implicitly assumed that importers are always on their demand function, and supply price elasticities are infinite so that the price of imports can be treated as exogenous (chapter 6.1).

⁹All variables in the Elasticity models are stated in natural logarithm form.

¹⁰The Elasticity model is specified in natural logarithm because (1) it provides elasticities coefficients directly, (2) it allows exports and imports to react in proportion to a rise and fall in the explanatory variables, and (3) on the assumption of constant elasticities, it avoids the problem of drastic falls in the elasticity as imports rise (see, for example Khan-Ross 1975).

of the Marshall-Lerner is not fulfilled (see chapter 6.1). Additionally Indonesia for the period 1967-1988 also has relatively high income elasticity of demand for imports (see equation 7.2.1.3 to 7.2.1.6) compared with income elasticity of demand for exports implying that the country has been dependent on imports (a high degree of openness) or a high propensity in Indonesia to import foreign goods particularly manufacturing but a low propensity of other countries to buy Indonesia's exports. These disparities in income elasticities of import and export demand reveal the evidence of the "Houthakker-Magee" effect indicating that the main problem of Indonesia's trade balance requires real economic policies of a structural nature.

$$x = 12.922 - 0.455 p^{IX} + 0.168 y^{I*} \quad 7.2.1.3 \text{ OLSQ}$$

$$(4.87) \quad (-3.19) \quad (1.18)$$

$$x = 7.282 - 0.218 p^{IX} + 0.142 y^{I*} \quad 7.2.1.4 \text{ LIML}$$

$$(4.25) \quad (-2.00) \quad (1.34)$$

$$m = 6.997 - 0.680 p^{Im} + 0.901 y^I \quad 7.2.1.5 \text{ OLSQ}$$

$$(3.46) \quad (-2.00) \quad (4.18)$$

$$m = 5.104 - 0.588 p^{Im} + 1.145 y^I \quad 7.2.1.6 \text{ LIML}$$

$$(2.31) \quad (-3.06) \quad (2.66)$$

The regression equations estimated by the techniques of OLSQ and LIML yield similar results. From a statistical point of view, all functions pass diagnostic tests adequately (appendix 7A) except for the Import function of 7.2.1.5 which does not pass the Constant-Variance test due to disturbances in the earlier period of 1967-1988. Imports in the earlier period had greater variances than those in the latter period because of the economic reform from the *Orde Lama* government to the *Orde Baru* government in 1965 (see chapter 6 regarding the Dummy variable model of the Import function). The F joint test in appendix 7A indicates the overall significance of explanatory variables of the Elasticities models; F computed exceeds the critical value at 5 percent level of significance.

Broadly speaking, the results of the Elasticities model demonstrate some robustness in explanatory terms in the sense that the exports and imports functions were able to explain reasonably well the current transactions fluctuation in the Indonesian economy as shown by their statistical properties and diagnostic tests. It seems that persistent balance of payments problems in the economy is partially due to the fact that the Marshall-Lerner criterion is not substantially satisfied, and the country has a relatively high degree of openness. The solution must be related to the characteristics of Indonesia's goods and services produced which determine the income elasticity for Indonesia's demand for exports and Indonesia's propensity to import.

7.2.2. The Absorption Model

The Absorption model also explains the current account but refocusing the analysis away from relative prices of exports and imports towards the aggregate income and spending of the economy. The AABP theory argues that devaluation will be successful if the gap between domestic output (Y) and domestic absorption (A) widens, where $TB=Y-A$. In terms of Trade Balance (TB) equation below, the coefficient of ψ_{31} must be greater in relative value than that of ψ_{32} for devaluation to improve trade balance.

$$\Delta TB = \psi_{30} + \psi_{31} \Delta Y^D + \psi_{32} \Delta A + \psi_{33} \Delta D \quad (7.2.2.1)$$

¹¹The inclusion of the ΔD variable in the Absorption model is determined empirically, *ad hoc*, by using F test to examine the statistical significance of adding ΔD into the Absorption model. The variable-addition test indicates that ΔD is significant in the economy. The inclusion of ΔD is justifiable since the Indonesian Government has been pursuing easy monetary policy by raising Domestic Credit Expansion to boost the economy development for the period under study. The detailed role of the ΔD in the economy can be seen in chapter 2.

The theoretical signs are expected to be $\psi_{31}>0$, $\psi_{32}<0$ and $\psi_{33}<0$. The magnitude of the parameter coefficients of ψ_{31} and ψ_{32} will determine whether the balance of payments will worsen or improve following devaluation. The empirical results of the Absorption model show that the parameters coefficients of ψ_{31} , ψ_{32} and ψ_{33} are in accordance with the theoretical expectations but the magnitude of the coefficients are relatively high. Unfortunately the magnitude of the parameters coefficients cannot be compared with those of previous empirical studies since there has not been any studies using the specific model of 7.2.2.1. Previous studies used different explanatory variables for the Absorption model in an *ad hoc* manner (Kenen-Pack 1980 and Miles 1979). Additionally the magnitude of the parameters cannot be settled *a priori* since a country faces different elasticities of exports and imports and diverse Marginal Propensity to Absorb (MPA). The results reveal high MPA in the economy as analyzed previously in chapter 6.2. Indonesia also has relatively high propensity to import (section 7.2.1). It suggests that deterioration of the balance of payments for the period 1967-1988 appears, to a certain degree, to be caused by relatively high spending in the economy which leaks to imports.

$$\Delta TB = 86.308 + 1.630 \Delta Y^D - 1.600 \Delta A \qquad 7.2.2.2 \text{ OLSQ}$$

(0.35)
(7.63)
(-7.33)

$$\Delta TB = -36.173 + 1.704 \Delta Y^D - 1.600 \Delta A + 0.268 \Delta D \qquad 7.2.2.3 \text{ OLSQ}$$

(-0.15)
(8.41)
(8.11)
(2.00)

$$\Delta TB = 62.128 + 1.863 \Delta Y^D - 1.881 \Delta A + 0.499 \Delta D \qquad 7.2.2.4 \text{ LIML}$$

(0.24)
(8.38)
(-8.24)
(2.91)

$$\Delta TB = -670.985 + 1.400 \Delta Y^D - 1.334 \Delta A + 0.937 \Delta D \qquad 7.2.2.5 \text{ 2SLSQ}$$

(-1.42)
(5.79)
(-5.48)
(2.00)

It appears that the parameter coefficients of the Absorption model estimated by single-estimation procedures of OLSQ and LIML (7.2.2.2, 7.2.2.3 and 7.2.2.4) are not significantly different from each other. The parameter coefficients of the model 7.2.2.5 estimated by 2SLSQ are lower than those estimated by

the single estimation procedures. Efficiency is not acquired by using the simultaneous-estimation procedure. The estimates of 2SLSQ in fact yield higher standard errors. This suggests that there is not any simultaneity problem in the model. Accordingly single-estimation techniques such as OLSQ and LIML are preferred to the simultaneous one for estimation purposes of the Absorption model. This fact is also supported by the results of Wu test of exogeneity. It reveals that the hypothesis of exogeneity cannot be rejected for the Absorption model ($0.41 < F_{critical} = 4.45$). From statistical property point of view, most of the Absorption models pass diagnostic tests satisfactorily except for the models of 7.2.2.2 and 7.2.2.3 which do not pass the Normality test (appendix 7B).

The overall performance of the Absorption models are satisfactory in terms of theoretical plausibility of the signs and magnitude of the parameters coefficients, the explanatory power of the variables ΔY^n , ΔA and ΔD , and in terms of the accuracy of coefficients which are statistically significant and pass the diagnostic testing. Domestic credit and income variables seem to exert significant and positive effects on the trade balance while higher absorption in the economy is related significantly with the trade balance deficit as predicted by the AABP theory. This finding may explain that balance of payments problems in the economy to some extent is caused by high propensity to absorb and high propensity to import.

7.2.3. The Reserve Model

The MABP theory is similar in spirit to the AABP but extends the theory by giving an explanation of the overall balance of payments, viewing the balance of payments not only in terms of the demand for and supply of goods but also in terms of demand

for and supply of money. The MABP theory may be examined by estimating the Reserve model ¹² as follows

$$\Delta R = \psi_{40} + \psi_{41} \Delta P + \psi_{42} \Delta Y^r + \psi_{43} \Delta D \quad 7.2.3.1$$

where the pattern of signs are expected to be $\psi_{41} > 0$, $\psi_{42} > 0$, and $\psi_{43} = -1$. Equation 7.2.3.1 represents the key relationship in the MABP theory that an increase in the price level and real income will improve the balance of payments via increases in the demand for money while increases in domestic credit will lead to foreign exchange reserves losses ¹³. The most important variable in the Reserve model is the ΔD coefficient which is known as the offset coefficient in the monetary literature. The coefficient is expected to be minus unity or to say that if there is an excess supply of money (increase in ΔD), there will be a proportional amount of loss of international reserves.

$$\Delta R = 247.327 + 7.373 \Delta P + 0.074 \Delta Y^r - 0.321 \Delta D \quad 7.2.3.2 \text{ OLSQ}$$

(0.96) (1.42) (2.83) (-2.40)

$$\Delta R = 404.353 + 1.300 \Delta P + 0.020 \Delta Y^r - 0.200 \Delta D \quad 7.2.3.3 \text{ LIML}$$

(2.00) (0.40) (1.62) (-2.00)

$$\Delta R = 1564.500 + 21.188 \Delta P + 0.087 \Delta Y^r - 2.018 \Delta D \quad 7.2.3.4 \text{ 2SLSQ}$$

(4.93) (3.83) (6.87) (-6.66)

Empirical results indicate that the offset coefficient, ψ_{43} , is significant in the economy, indicating a negative relationship between domestic credit expansion and change in foreign exchange reserves. The offset coefficient estimated by the single-estimation techniques is between -0.20 and -0.32.

¹²Although variable of the Reserve model is in terms of ΔR and ΔD , the concept of the offset coefficient is still applied irrespective of the expression for R and D as long as these variables are equivalently transformed, for example R and D , ΔR and ΔD , and $\Delta \log R$ and $\Delta \log D$ (Kreinin-Officer 1978)

¹³This proposition is at variance with the AABP theory in which rising income increases imports and generates reserves outflows leading to the balance of payments deficit, while an increase in domestic credit will lead to an increase in domestic investments thereby leading to a balance of payments surplus.

However, the coefficient jumps to -2.018 when estimated by the simultaneous equation technique of 2SLSQ.

All parameter coefficients of the Reserve models were correctly signed and significant in terms of the MABP theory except the price coefficients estimated by the single estimation techniques were not statistically significant. In general the Reserve model performs fairly since the *a priori* theoretical criteria are satisfied except the magnitude of the coefficient on the price and domestic credit variables which are relatively high. As regards the magnitude of the offset coefficient ($=-2.018$), previous studies in developing countries ¹⁴ (Aghevii-Khan 1977) indicate that offset coefficient is significant but statistically less than minus unity. An offset coefficient greater than unity as in the model 7.2.3.4 indicates "overmonetization". This happens particularly during the period of an oil boom when the country experiences a huge amount of foreign exchange reserves. Rising export earnings and international reserves give the reserve money base for rapid expansion of domestic credit, partly accomodating cost price inflation and partly in response to domestic investment boom. The domestic credit expansion increases as the Authorities monetize the oil revenues. Therefore as expected the offset coefficient is negative and significant. The huge expansion of domestic credit leads to higher spending in the economy which then leaks to imports. This in turn runs down foreign exchange reserves. In the following years the Authorities has to undertake other devaluations. Since the government has consistently increased domestic credit expansion, the outcome has been double digit inflation in the economy (chapter 2) as a

¹⁴The countries in the sample were Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cyprus, the Dominican Republic, Ecuador, El Salvador, Ethiopia, Greece, Guatemala, Honduras, India, Iran, Israel, Jamaica, Kenya, Korea, Malaysia, Mexico, Morocco, Nicaragua, Pakistan, Panama, Paraguay, Peru, the Philippines, Sri Lanka, the Sudan, Tanzania, Thailand, Tunisia, Turkey, the Republic of China, Uganda, Uruguay, Venezuela.

result the magnitude of the price coefficient (ψ_{41}) is relatively large. It is theorized that a one per cent increase in prices will reduce real money balances by only the same amount ($\psi_{41}=1$), this in turn will lead to a reserve inflow just sufficient to restore real money balance to their previous level.

Compared to estimates of the single equations, efficiency is gained by employed 2SLSQ procedure however the Wu test indicates that the hypothesis of exogeneity cannot be rejected ($1.77 < F_{critical} 4.45$). Since there is conflicting statistical evidence for the model 7.2.3.4, not much confidence can be put on the result of 2SLSQ ¹⁵.

7.2.4. The Capital Model

The Capital model known also as Portfolio Balance model in the monetary literature provides the basis for an empirical analysis of capital movement into and out of a country. The Capital model developed in chapter 3 is as follows

$$K = \psi_{50} + \psi_{51} CB + \psi_{52} \Delta Y^n + \psi_{53} i^* + \psi_{54} \Delta D \quad 7.2.4.1$$

where *a priori* signs are as follows $\psi_{51}, \psi_{54} < 0$, $\psi_{52} > 0$ and $\psi_{53} < 0$. The offset coefficient of ψ_{51} and ψ_{54} is expected to vary according to the degree of international capital mobility; it lies in the closed interval between zero (implying no capital mobility) and minus one (implying perfect capital mobility). The current account balance enters the Capital model as an exogenous source of change of base money. A positive current balance involves a reserve inflow, and a negative one an

¹⁵Those results in part reflect the technique which is dependant on the choice of instruments.

outflow. To tackle the well known econometric problem of simultaneous equation bias, the Capital model was also estimated by simultaneous equation procedure of 2SLSQ.

$$K = 1181.400 - 0.036 CB + 0.014 \Delta Y^n - 169.520 i^* - 0.098 \Delta D \quad 7.2.4.2 \text{ OLSQ}$$

(3.36) (0.44) (0.56) (-3.49) (-1.14)

$$K = 1111.300 - 0.035 CB + 0.013 \Delta Y^n - 162.380 i^* - 0.091 \Delta D \quad 7.2.4.3 \text{ LIML}$$

(3.37) (0.46) (0.53) (-3.61) (-1.08)

$$K = 861.234 - 0.031 CB + .010 \Delta Y^n - 101.842 i^* - 0.217 \Delta D \quad 7.2.4.4 \text{ 2SLSQ}$$

(2.86) (0.46) (0.55) (-2.24) (-2.33)

The results indicate that all of the estimated coefficients have the expected signs but they are not significant in explaining capital flows except for the world interest rate. This provides the view that capital movements largely respond to the fluctuation of foreign interest rates. It is clear that from time to time there are substantial capital flows arising from movements in the world interest rate (chapter 2). The Wu test of exogeneity indicates that hypothesis of exogeneity can be accepted; it is also supported by the fact that lower standard errors are gained by using the simultaneous technique of 2SLSQ. The fit of the Capital models as measured by R^2 is relatively low ($0.52 < R^2 < 0.61$). Effects of the explanatory variables of the Capital model (CB, ΔY^n , i^* and ΔD) also tend to be weak since $F_{\text{computed}} < F_{\text{table}}$ (appendix 7D) and insignificant but generally conform to the relation implied by the CMABP hypothesis.

The results of the Capital model was poor in terms of explanatory power and accuracy of the parameter coefficients. The poor performances of the Capital model might be due to the fact that the Indonesian financial market is not yet developed. This may mean that the condition of perfect capital mobility employed by the Capital model for the economy is not satisfied as shown by the ψ_{54} coefficient which statistically equals zero.

7.2.5. Overall Performance

The single and simultaneous estimation results carried out in this study all appear to be favourable in terms of the expected signs to the balance of payments hypothesis namely the Elasticities, Absorption and Reserve models. All models are subjected to the diagnostic tests employing annual data for the period 1967-1988. Most models pass the various diagnostic tests for misspecification, namely the tests of homoscedasticity, normality, non-correlation and structural stability as shown in the Appendix 7A to 7D. They are therefore satisfactory from a statistical viewpoint except for the Absorption functions (7.2.2.2 and 7.2.2.3) which do not pass the Normality tests, the Capital function (7.2.4.2) which does not pass the Functional Form test, and Import function of the Elasticities model (7.2.1.2) which does not pass the Constant-Variance test. However they all pass the other diagnostic tests adequately.

The Wu test of exogeneity ¹⁶ is applied to the Absorption, Reserve and Capital models to test whether the reaction function of ΔD (Domestic Credit Expansion) can be treated as exogenous for simultaneous-estimation procedures.

The results in the table 7.2.5.1 show that the hypothesis of exogeneity cannot be rejected for the Absorption, Reserve and Capital models. According to this finding, simultaneous-estimation techniques do not have to be used in calculating the balance of payments models. This fact is verified by the

¹⁶There have been some tests of exogeneity suggested in the econometric literature, i.e. Granger (1969), Sim (1972), Revankar (1978) and Wu (1978) tests. This study employs Wu test for testing exogeneity of ΔD functions. However this study does not discuss the concept of weak, strong and super exogeneity as proposed by Engle-Hendry (1983) nor to justify the relevance of the test since the methodology is in variant with the Cowles Foundation School which views that exogeneity cannot be tested; it has to be specified theoretically in advance, *a priori* (Cooley-LeRoy 1985, Revankar 1978).

superiority (statistical performances and efficiency) of the single estimation results in appendix 7A to 7D.

Table 7.2.5.1
Wu Test for Exogeneity of ΔD
for Balance of Payments Models 1966-1988

Model	F computed	F critical 5%
AABP	0.41	4.45
MABP	1.77	4.45
CMABP	0.06	4.45

The absence of efficiency gains from using 2SLSQ except for the Reserve model suggests that in practice there is no advantage in using a consistent alternative such as the simultaneous-estimation procedure to estimate the balance of payments models. One reason may be due to the small number of observations employed. Turnovsky (1978) has shown that in a small sample the results of single equation estimations will be relatively similar to that of simultaneous procedures; bias is expected to vanish ¹⁷. This implies the superiority of single-estimation techniques on all models as analyzed previously in chapter 6. Another possibility of obtaining a more efficient estimator is taken by applying the method of LIML to the balance of payments models. Result indicates that LIML estimates are similar to those of OLSQ; this was shown by their t values as an indication of the efficiency differences.

A stability test is employed to examine the hypothesis of parameter constancy for the Elasticity, Absorption, Reserve, and Capital models. Chow 2nd test is used instead of the Analysis of Variance test since the number of observation is

¹⁷Cragg (1967) even argued that simultaneous equation methods are biased in small samples.

relatively small to split up the sample into two periods. Considering the predictions of the balance of payments models for 1986-1988 using the estimated equations for 1966-1985, it yields F statistics as follows

Table 7.2.5.2
Test for Stability *
for Balance of Payments Models

Model	F computed	F critical 5%
Elasticity		
Export (X)	2.22	3.24
Import (M)	0.18	3.24
Absorption	1.46	3.29
Reserve	1.01	3.29
Capital	3.40	3.29

$$* F_{n_2, n_1-k-1} = (RSS - RSS_1) / (n_1 - k - 1) \cdot (RSS_1)^{-1} \cdot (n_2)^{-1}$$

Thus at the 5 per cent significance level, the hypothesis of stability cannot be rejected for the balance of payments models except for the Capital model which is unstable. Most of the models perform relatively stable.

Table 7.2.5.3 indicates that the set of the independent variables of the Elasticities and Absorption models explains a significant proportion of the variation in the balance of payments fluctuations as shown by their F statistics except for the Reserve and Capital models of which their Fs computed is less than Fs critical. The values of the Durbin Watson (DW) statistics indicates that the models are acceptable in a sense that the disturbance terms are independently and randomly distributed over the sample period 1967-1988.

Table 7.2.5.3
Statistical Performances of the Models

Model	R ²	F	σ	DW
Elasticity (X)	0.74	16.18	0.10	1.80
Elasticity (M)	0.96	94.37	0.13	1.90
Absorption	0.81	25.14	1045.60	2.05
Reserve	0.60	1.43	930.68	2.22
Capital	0.52	3.28	589.75	2.01

Overall the Reserve and the Capital models are less robust compared to the Elasticities and the Absorption models in terms of theoretical signs, goodness of fit, and the significance of coefficients. The summary statistics suggest that the Indonesian balance of payments experience over the period 1967-1988 can be explained well by the AABP and the EABP hypotheses and less well by the MABP and the CMABP hypotheses.

7.3 Use of the Models for Policy Analysis

This section explores how the balance of payments models can be employed for policy analysis. In particular it evaluates Indonesian macroeconomic policies; the government adopted devaluation policies successively in the year of 1968, 1973, 1983, 1985 and 1987. For policy purposes, the balance of payments models developed are useful since the models contain the instruments of macroeconomic policies as explanatory variables, thereby facilitating prediction of the effects of changes in monetary and fiscal policies on the balance of payments.

The economic literature gives several alternative macro policies which can be used to alleviate balance of payments problems. The problems of arriving at a consensus are compounded by the number of alternative scenarios which can be applied. Although adjustment policies such as a devaluation may be a necessary for correcting balance of payments deficit, they may not be sufficient. They have to be supplemented with other fiscal and monetary policies. Since both fiscal and monetary policies affect internal and external balances, it is crucial that each policy should be paired accordingly to "the Principle of Effective Market Classification". If the country does not follow this objective it will move even further from both internal and external balances (see chapter 3.6 on the Balance of Payments Policies). Another point is to identify whether the balance of payments deficits are temporary or permanent. If the disequilibrium is temporary, it can be cured by capital inflows (such as by short-term financing or borrowing). The empirical results (chapter 6) show that, firstly, Indonesia's weak trade balance is progressively seen as structural problems in which the difficulties in fact originated from the supply side as evident of structural rigidity. Secondly, the magnitude of the coefficient of MPA is relatively high indicating that the economy has been importing more than she exports. The government has not been succesful undertaking consecutive devaluations because Indonesia has been buying more from abroad; unless absorption declines relative to production, the trade balance deficit shall persist. Since the devaluations do not cause enlargement in output and reduction in absorption, changes in exchange rate would not lead to a permanent correction in the Indonesian trade balance Thirdly, an increase in the domestic element of the Indonesian high-powered money via domestic credit, by either the Bank of Indonesia or commercial banks, will spill over in the balance of payments. It follows that a continuous balance of payments deficit in the Indonesia economy occurred partly because of the amplification of domestic credit. Fourthly, it seems that high

inflationary economy, fiscal deficits, the fear of devaluation and high world interest rate were the primary causes of capital flight; for example an increase in the world interest rate and increased expectation of devaluation would motivate capital outflows before exchange rate changes. In addition an increase in the domestic credit or the monetary base would be significantly offset by an outflow of capital. Whereas capital inflows were associated with high domestic interest rates during the stabilization period.

The above phenomena may explain why Indonesia has been hampered with balance of payments problems since the last decade whereby Suharto's Cabinet has adopted a devaluation policy for correcting deficits in 1968, 1973, 1978, 1983, 1985 and 1987. An improvement in the competitiveness via the devaluations cannot cure the payments problems because the deficits are persistent reflecting fundamental disequilibrium. This in turn has important policy implications for Indonesia as macropolicies dealing with the root causes of the balance of payments problem will attain more efficient impact on the economic growth. Since the payments problems are not temporary, appropriate monetary and fiscal policies have to be undertaken besides devaluations for example by reducing demand for imports (deflating domestic demand and or imposing import controls). With the problems of unemployment and balance of payments deficits, Indonesia can reach full employment and balance of payments equilibrium by using expansionary fiscal policy in the form of an increase in government spending and tight monetary policy in the form of a decrease in the domestic credit expansion and an increase in the interest rates. Since the BP curve is not infinitely elastic, a monetary policy (by setting high domestic interest rates) can be used to attract capital inflows thereby correcting a deficit in the balance of payments. The capital flows to Indonesia serves two purposes, firstly, they provide foreign exchange and secondly, they constitute source of saving. In both respects

foreign capital can contribute to growth in developing countries and may be its main determinant of growth. However this process could not be expected to take place spontaneously, for it would be inhibited by a series of structural obstacles to the economic development as indicated. Hence a series of measures can be proposed to promote a process of industrialization including government intervention in the formulation of microeconomic policies and as a direct productive agent. Among the economic policies suggested were exchange controls, the attraction of foreign capital into manufacturing and the stimulation of domestic investments particularly export oriented investments and import substitution in order to reduce scarcity of foreign exchange and promote domestic manufacturing activity. Policies designed to work straight on manufactured exports, however, will be more efficient such as concentrating on the type of goods exported within the product range like quality, reliability, maintenance and marketing.

The Elasticities Model

The Elasticities model can be employed for policy formulation on the markets of exports and imports. The results indicate low price elasticity of demand for exports and imports. Despite the fact that the Marshall-Lerner condition is fulfilled in the long run, the price elasticities of imports and exports are still relatively low; they are not substantially greater than one. Moreover there is no assurance that a gained change in competitiveness via devaluations can be maintained persistently since the gain is only temporary (Thirlwall-Gibson 1992). Moreover the necessary condition is not sufficient for a devaluation to improve the trade balance. In fact the sufficient condition of Marshall-Lerner shows that in the SR, the trade balance ameliorates but deteriorates in the LR, thus a reverse "J-curve" effect is suggested (see also chapter 6.1). In

estimating the above price elasticities of imports and exports, it is assumed that domestic price level were constant (no "pass-through" effect). To examine this assumption (the robustness of the price elasticities of exports and imports), a "pass-through" function have to be examined. The estimated pass-through equation (see chapter 6.1) reveals that independent variables (exchange rate, import price, money supply and lagged domestic price) are significant in explaining domestic price responses during 1960-1988. SR pass-through. The necessary and sufficient conditions might have been satisfied if pass through effect are not significant. The significance of the pass through coefficient reveals that it is difficult to sustain domestic price changes due to devaluation. Hence inflationary effects counteract the price advantages that the devaluation is designed to give Indonesia's product in the foreign and domestic market ! Also, an improvement in the competitiveness via devaluation cannot cure the balance of payments disequilibrium permanently to counter the adverse structural factor in the economy affecting indonesia's balance of payments. Those low price elasticities in both imports and exports markets may explain why Indonesia has been hampered with balance of payments problems since the last decade whereby the Authorities has adopted devaluation policy for correcting deficits in the balance of payments in 1968, 1973, 1978, 1983, 1985, and 1987. The devaluations were not successful since the price elasticities of demand for exports and imports have not been large enough so that the increase in exports and the reduction in imports together have not more than offset the terms of trade loss. Consequently Indonesian foreign exchange receipts have been suffering as a result of the devaluations and the balance of payments have been deteriorating. Because of the low price elasticity of import demand, the quantity of goods imported is reduced only slightly causing the demand curve for foreign exchange to be also inelastic. Devaluation fails to eliminate the excess demand for foreign currency. The world demand for Indonesian export is

also inelastic abroad, consequently variation in the level of aggregate demand in foreign countries does not have much effect on Indonesia's exports. The unresponsiveness of the export price variable indicate that Indonesian merchandise exports would not be able to compete in the world market. Devaluation therefore increases rather than eliminates the existing excess demand for foreign exchanges because at lower prices after devaluation only a small number of additional merchandise is exported. Since "the elasticity pessimism" is observed, according to the economic theory the Authorities could have undertaken revaluation policy instead of devaluation policy to alleviate the balance of payments problems. However, the reason why revaluation policy is not popular in Indonesia is due to the fact that one of the purposes of Indonesia's devaluations is to improve the incomes of the non oil traded goods sectors (cheapening their export prices), the goal of longer-run growth and employment strategy (see for example Woo-Nasution 1987), revaluation therefore would hurt the tradable sector of the domestic economy. Accordingly the macroeconomic policy has to be directed at the both production of exports (export oriented policy) and of imports substitutes (import substitution policy) encouraging the consumption of domestically produced goods. The main problem of exports requires real economic policies of a structural nature related to wider characteristics of exported goods such as the quality and marketing so that Indonesian products will be able to compete in the world market. This will facilitate a more outward looking market oriented Indonesian economy. The country also has relatively high income elasticity of imports ($0.901 < \xi_m < 1.140$) implying that the economy has been very dependent on imports. It suggests that imports is very sensitive to incomes, a one per cent increase in domestic income induces 0.90 to 1.14 per cent increase in imported goods. The openness of the economy escalated since *Repelita I* in 1970 when the free foreign exchange system was instituted.

Concludingly Indonesia's weak trade balance is progressively seen as a structural problem related to the capacity to produce and to the characteristics of goods exported which are not answerable singularly to devaluation. Structural policies such as raising productivity and efficiency of the domestic economy is mainly recommended besides commercial controls (tariffs, quota, and other quantitative restrictions on the flow of international trade).

The Absorption Model

The Absorption Model like the Elasticities model also deals with current account but concentrating on the whole spending and receipts of the economy. The results reveal high Marginal Propensity to Absorb (MPA). Appropriately the Authorities has to regulate spending of the private and government sectors to rectify a deficit in the balance of payments. The previous devaluations were not efficacious because they did not cause the gap between domestic output (Y) and domestic absorption (A) to widen; national output did not increase by more than its absorption. After several devaluations, the economy still has experienced relatively high Marginal Propensity to Absorb (MPA); the devaluations in fact did not incline to reduce absorption because, firstly, exchange rate changes increases expenditure (since it improves the trade balance) thereby promoting an increase in income. This increased income raises absorption thereby raising imports and offsetting the effects of the devaluation, secondly, since domestic absorption has not been reduced, the expenditure switching policy such as devaluations only led to an increase in domestic prices (chapter 2) that completely neutralized by the competitive advantage conferred by devaluation without any permanent reduction of the balance of payments deficit. To achieve the external balance, the Authorities has to combine expenditure switching policy with contractionary monetary policy (see also chapter

3.6). However this must be accompanied by domestic policies which leads to a reallocation of resources in the non oil economy, for example by sectoral diversification away from dependence on primary products, in the face of a continuous decline in Indonesia terms of trade resulting from falling oil prices (Hall-Hill 1984); it is intended to reduce the economy's vulnerability. Additionally import restrictive policy has also to be taken to avoid excess spending abroad since the propensity to import is relatively high. In a nutshell no policy can be effective unless it raises output relative to absorption and or reduces absorption relative to output.

The Reserve Model

The Reserve Model proposes that a deficit in the balance of payments results from excess money supply over its demand for money; any differences between ΔM shows up as ΔR . Empirical results for Indonesia indicate that the offset coefficient (ΔD) is statistically significant in the economy ($-0.321 < \phi < -2.018$). It indicates a negative relationship between domestic credit expansion and change in foreign exchange reserves. Changes in foreign exchange reserves were as a result of excess demand for or supply of money. It seems that the balance of payments problems partly have resulted from an excess in the money supply (increases in ΔD) over the demand for money. According to this approach, since all balance of payments difficulties have their origin in monetary disequilibrium, monetary correction is therefore necessary for achieving the external balance. The Authorities have to commence tight monetary policies in the future to prevent balance of payments deficit, and to dampen inflationary effect of devaluations. The policy recommendation is supported by economists at the IMF (Aghevli-Khan 1977). Although it contradicts with Thirlwall (1980) who argues that a link between supply of credit and the balance of payments does not

imply the direction of causation and Bird (1988) who also argues that the balance of payments problems in the developing countries are not related to excess supply of money ¹⁸. However, Bird and Thirlwall views are supported by the econometric test conducted earlier about the exogeneity of the ΔD variable.

The Capital Model

The Capital Model, contrary to the Reserve model, argues that exogenous changes in the supply of and demand for money have no influence on the current balance and the net inflow of official capital other than international exchange reserves. Thus, the surplus or deficit is confined to private capital flow (K), so the private capital flow replaces the change in the foreign reserves (ΔR) as the dependent variable in the Reserve model. The results indicate that capital flow is responsive only to the world interest rate. The world interest rate elasticity of capital flow in all cases is found to be significantly different from zero. This result is plausible since there is no capital control in the economy. This finding allows the government to direct monetary policy to achieve the external balance. The government may increase its domestic interest rate to rectify a deficit by attracting capital inflow into the country so that the worsened trade balance would be accompanied by an increased capital inflows or reduced capital outflows. This type of monetary policy is recommended since free foreign exchange has been one of the factors in the economy which have eased capital inflows and made Indonesia an attractive place for foreign investments (GATT 1991).

¹⁸On the contrary Haberler (1966) argues that only in rare cases should the cure of a deficit be tailored to the nature of the cause. Since rarely can a deficit be caused solely to just one factor. It is common to find several conflicting factors contributing to the disequilibrium.

7.4. Forecasting Ability of the Balance of Payments Models

In assessing the empirical adequacy of the models, an additional approach will be employed, namely the evaluation of forecasting performance. This procedure provides perspectives about the scope of the model, the period to when it was fitted and the type of prediction it generates. To test forecasting performance, it is preferable to use data beyond the period of fit. If the *ex post* extrapolations yield good predictions, more confidence can be placed in the model's ability to predict *ex ante*. This study uses *ex post* forecasts to judge the accuracy of forecasting performance of the balance of payments models. *Ex post* forecasts use the actual values of the predetermined variables to calculate the predicted values of the endogenous variables; any errors which result are therefore attributable only to the model itself. Then the robustness of the model can be assessed directly. *Ex post* estimates are obtained for the sample period of 1966-1985. Direct comparison of the forecasting performance of the model can be presented since each model's forecast is available for the identical period.

It has been argued that the "true test" of a model is its ability to forecast *ex ante* (Stekler 1970), nevertheless it is necessary to utilize *ex post* approach to evaluate the model properly (Theil 1966). To judge the forecasting performance, a number of formal criteria may be used to determine the accuracy of a forecast in the literature (Klein-Young 1980). These criteria include the performance of the model relative to some naive method of forecasting and the degree to which the model's rate of change corresponds to the direction and extent of the observed changes. Although there are some measures, there is no consensus on the best procedure to be used (Stekler 1970).

The evaluation of the forecasting ability of the balance of payments model is accomplished by using a naive time series

model as a benchmark for comparison. The basic idea of the naive model of forecasting is that past patterns in the data will be repeated in the future; for some variable Y the forecast value for period t is the value of the variable in period $t-1$, formally as follows

$$Y_t = \alpha_1 Y_{t-1} \quad 7.4.1$$

to account for the probabilistic nature of time series is to include a stochastic term v_t to give

$$Y_t = \theta_1 Y_{t-1} + v_t \quad 7.4.2$$

where the random term v_t is a white noise, or formally as follows

$$E(v_t) = 0; E(v_t^2) = \sigma^2; E(v_t v_s) = 0 \text{ for } t \neq s; \text{ where } \sigma^2 \text{ is a constant.}$$

Accordingly the econometric model and its naive models for the Export function of the Elasticities model can be derived respectively as follows

$$X_t = \psi_{10} + \psi_{11} P^x_t + \psi_{12} Y^{*}_t + \varepsilon_{10t} \quad 7.4.3$$

$$X_t = \theta_{10} X_{t-1} + v_{10t} \quad 7.4.4$$

whereas for the Import function of the Elasticities model is

$$M_t = \psi_{20} + \psi_{21} P^m_t + \psi_{22} Y_t + \varepsilon_{20t} \quad 7.4.5$$

$$M_t = \theta_{20} M_{t-1} + v_{20t} \quad 7.4.6$$

for the Absorption model is

$$\Delta TB_t = \psi_{30} + \psi_{31} \Delta Y^n_t + \psi_{32} \Delta A_t + \varepsilon_{30t} \quad 7.4.7$$

$$\Delta TB_t = \theta_{30} \Delta TB_{t-1} + v_{30t} \quad 7.4.8$$

for the Reserve model is

$$\Delta R_t = \psi_{40} + \psi_{41} \Delta P_t + \psi_{42} \Delta Y^n_t + \psi_{43} \Delta D_t + \varepsilon_{40t} \quad 7.4.9$$

$$\Delta R_t = 0.40 \Delta R_{t-1} + u_{40t} \quad 7.4.10$$

and for the Capital model is

$$K_t = \psi_{50} + \psi_{51} CB_t + \psi_{52} \Delta Y_t + \psi_{53} i^*_t + \psi_{54} \Delta D_t + \varepsilon_{50t} \quad 7.4.11$$

$$K_t = 0.50 K_{t-1} + v_{50t} \quad 7.4.12$$

To evaluate the accuracy of the forecasts of the naive and the econometric models of the balance of payments, Mean Absolute Prediction Error (MAPE) and Root Mean Square Error (RMSE) will be employed. MAPE is obtained by adding up the the absolute values of the error and computing the average as follows

$$MAPE = \frac{1}{n} \sum |F_t - A_t| \quad 7.4.13$$

where n stands for sample size, F for forecast value, A for actual value, and subscript t for time.

Whereas RMSE is a measure of the standard deviation of the forecast around the actual value, and gives more proportionate weight to large forecast errors than to small ones. It is preferred to the MAPE in the same way that the variance is to be preferred as a measure of dispersion to measures based on absolute deviations ¹⁹. In addition it is consistent with the notion of a quadratic loss function ²⁰. RMSE will be compared with its equivalent, the standard deviation of the disturbance terms or σ_ε . If the model performs well, it is expected that

RMSE $\sim \sigma_\varepsilon$, where

$$RMSE = \sqrt{\frac{1}{n} \sum (F_t - A_t)^2} \quad 7.4.14$$

¹⁹Studies using RMSE include Sims, C.A. 1967. "Evaluating Short-Term Macroeconomic Forecast: The Dutch Performance", May, pp.224-36; and Stekler, H.O. 1968. An Evaluation of Quarterly Judgmental Economic Forecasts", *Journal of Business*, July, pp.320-39.

²⁰Theil, H. 1966. Applied Economic Forecasting (Amsterdam: North Holland), pp.15-19.

$$\sigma_e = \sqrt{1/n \sum e_t^2} \quad 7.4.15$$

Although this criterion does not provide insight into the relative strengths of the different balance of payments models in comparisons, it does present an information theoretic interpretation of goodness of fit (Harvey 1986). The evaluations concentrate on the accuracy of each balance of payments theory as reflected in its model rather on a detailed forecasting evaluation individually. The comparison of forecasting performances covers the year of 1966 to 1985 ²¹. *Ex post* forecasts of various balance of payments theories will be checked against existing data and provide a means of evaluating a forecasting performance of each model as illustrated below

1965	66		83	84	85	86	87	88	89	90	91	1994
+	+	+	+	+	+	+	+	+	+	+	+	+
+			+			+			+			
			Estimation Period			Ex post Period			Ex ante Period			
			(Fitting)			(Comparison)						

The naive forecast obtained from the autoregressive model of 7.4.2 is compared with forecasts derived from econometric models of the balance of payments over a post sample period of 3 years, 1986, 1987 and 1988. Table 7.4.1 gives a summary of the comparison between the naive and the econometric models of the balance of payments.

²¹ Because of data limitation, *ex ante* comparison is not estimated, whereas *ex post* comparison is calculated only over three years of 1986, 1987, and 1988.

Table 7.4.1
Ex Post Forecast Comparison of
the Naive and the Econometric Models
and their Corresponding Actual Values

Year	Actual Value	Naive Model	Econometric Model
EABP-X 1986	9.8302	9.8469	9.9057
1987	9.7031	9.8669	9.8145
1988	9.6942	9.8870	9.8797
MAPE		0.1244	0.1241
RMSE		0.1464	0.1323
EABP-M 1986	9.5532	9.7391	9.5140
1987	9.3373	9.8474	9.3974
1988	9.1237	9.9568	9.2777
MAPE		0.5097	0.0582
RMSE		0.5741	0.0981
AABP 1986	-3210.6	12.8456	-3247.4
1987	2097.2	14.7760	2203.3
1988	744.2	2.3515	1031.2
MAPE		159.7244	118.7818
RMSE		2294.9000	177.9408
MABP 1986	-469.0	29.6958	463.2046
1987	1500.0	5.5115	-484.3226
1988	-705.0	1.0229	2019.5
MAPE		96.5899	788.8648
RMSE		996.7717	1475.8
CMABP 1986	-1011.0	340.7448	-1634.7
1987	-306.0	120.8189	688.1031
1988	-366.0	42.8392	-1511.9
MAPE		729.1343	258.4945
RMSE		851.7703	946.9742

The findings reveal that the econometric models of the Elasticities and Absorption forecast better than their naive models. While for Capital model, under MAPE criterion the econometric model outperforms the naive model; but under RMSE criterion then the naive model is better than the econometric model. However, for the Reserve model, the naive model performs better than its econometric one. By comparing the balance of payments models with their naive models, it appears that the Elasticities and Absorption models performs better than the Capital and Reserve models; it is in line with earlier results about the robustness of the Elasticities and Absorption models. The results obtained for the Reserve and Capital models are not in accordance with previous studies. The picture that emerges from the empirical literature on comparative forecasting is that in general econometric model forecasts outperform the naive time series competitors (Granger-Newbold 1977); and in particular Fair (1970, 1974) shows that a small econometric model outperforms naive time series model in *ex post* comparison.

Formal analysis is also measured by comparing RMSE against the standard deviation of the disturbance terms hence the conclusions concerning the forecasting performance can be drawn. If the balance of payments model performs well over the forecast period as it does over the estimation period; it forecasts the data equally as well as it tracks the data, it is expected the $RMSE \approx \sigma$. Conversely if RMSE substantially exceed σ then this would indicate poor forecasting performance of the model over the estimation period. Based on this criterion the Elasticities and Absorption models are in the top position followed by the others. The Capital model ranks last as shown in the table 7.4.2 below.

Table 7.4.2
Rank According to $(RMSE - \sigma) RMSE^{-1}$

Rank (1)	Model (2)	$(RMSE - \sigma) RMSE^{-1}$ (3)
1	Elasticity M	0.091
2	Elasticity X	0.169
3	Absorption	0.408
4	Reserve	0.506
5	Capital	0.666

By and large the Elasticities and Absorption models performed well over the forecast period of 1986-1988 as they do over the estimation period of 1967-1985. The models forecasted the Indonesian data as well as tracking the data since the $RMSE \approx \sigma$. Although the other models do not forecast satisfactorily, it does not mean that they are not the "true" models since satisfactory forecasting performance is only one of the characteristic of true model (Theil 1962, 1966).

In comparing the statistical performance of the balance of payments models, this study also utilizes Bayesian model selection in which the alternative models are treated symmetrically, then the model which is expected to perform best with respect to a particular loss function is chosen. In the econometric literature, a popular criterion for model selection is the Akaike Information Criterion, AIC ²². The AIC test is used for testing nested as well as non-nested ²³ hypotheses (Harvey

²² Another Bayesian statistic is Theil's Adjusted Multiple Correlation Coefficient or R^2 (Theil 1977), however some econometricians demphasize the use of R^2 for comparing goodness of fit among models (Godfrey-Newbold 1976).

²³ The hypothesis are said to be nested if one hypothesis assumes that the parameter vector lies an a subspace of parameter space assumed under the other hypothesis whereas the hypothesis are called non-nested or separate because the explanatory variables under one of the balance of payments hypotheses are not a subset of the explanatory variables in the others; one may not be obtained from the others by the

1990). The concept of AIC basically is to compare the maximized values of their likelihood functions after adjusting for sample size (n). The decision rule is to select between models for which AIC is minimum, formally as follows

$$AIC = -2 \log L(\psi) + 2n \quad 7.4.6$$

Where $L(\psi)$ denotes the logarithm of the likelihood function evaluated at estimator ψ and n denotes the number of parameters.

From a Bayesian point of view, the Absorption model ranks first followed by the Reserve model then the Capital model; a Bayesian test using the AIC criterion discriminates in favour of the Absorption model ²⁴.

Table 7.4.3
The Log Likelihood and Akaike Information Criterion
for Balance of Payments Models 1966-1985

Ranking	Model	LogLikelihood	AIC
1	Absorption	- 156.110	0.607
2	Reserve	- 154.749	0.652
3	Capital	- 142.131	0.726

By examining statistical performance against the models (table 7.4.4) similar conclusions are arrived in that is the Elasticities and Absorption models are still superior to the others. This finding is credible since the balance of payments transaction in a developing economy like Indonesia is mostly

imposition of restrictions or as a limiting form of a suitable approximation.

²⁴The Elasticity models, X and M functions, are not comparable with the other models since all variables in the Elasticity models are stated in natural logarithm form. AIC cannot be employed to compare models which involve different levels of specification (Akaike 1983). The Log likelihood for X function is 16.04 whereas for M function is 12.03.

dominated by the current account transactions ²⁵ as analyzed by the Elasticities and the Absorption approaches and simple model specification such as the Elasticities and Absorption models yield more accurate forecasts which may be due partly to lesser sensitivity to Indonesian data inadequacies.

Table 7.4.4
Overall Statistical Performances, 1966-1985

Model	RMSE	MAPE	AIC	Stability test
Elasticity M	0.0981	0.0582	na	2.22
Elasticity X	0.1323	0.1241	na	0.18
Absorption	177.9408	118.7818	0.607	1.46
Reserve	1475.8000	788.8648	0.652	1.01
Capital	946.9742	258.4945	0.726	3.40

It appears that Bayesian Discrimination (AIC) and Forecasting (MAPE and RMSE) statistics both support the view that the Absorption models outperform the Reserve and the Capital models. Although RMSE and MAPE criteria do not reach the same outcome regarding the performance of Reserve and Capital models.

²⁵Whereas the Monetary and the Capital Market approaches focus the analysis on the money-market side and the capital-accounts side of the balance of payments.

7.5. Summary and Conclusions

This chapter has applied single and simultaneous estimation procedures to the various balance payments theories, namely the Elasticities (EABP), Absorption (AABP), Reserve (MABP) and Capital (CMABP) models. Three tests have been considered for assessing the competing hypothesis, namely Diagnostic tests, Forecasting tests, and Bayesian Discrimination test. All estimations were carried out for the period of 1967-1985 and 1967-1988. Formal diagnostic tests use the tests of the non-autocorrelated error assumption by using Lagrange Multiplier tests (Godfrey 1978), the test of functional form of misspecification by using Ramsey's RESET test (Ramsey 1969), the test of randomness of the residuals by using Normality test (Jarque-Bera 1981), the test of variance constancy by using Heteroscedasticity test (Koenker 1981) and the test of the constancy of regression coefficients by using Chow's 2nd Stability test (Chow 1960).

The models appear to perform adequately in terms of the diagnostic tests. Most of the models are relatively stable for the whole period of 1967-1988. Given this, the models can be employed for policy modelling by the Authorities. The estimates of the balance of payments models for the period 1967-1985 and those of 1967-1988 do not differ significantly. This signifies the stability tests conducted proved that the parameter coefficients of the models are stable. The results of the single-equation estimations are relatively similar to those of the simultaneous procedures, moreover the absence of efficiency gains from using the simultaneous procedures implies the superiority of the single-estimation techniques on the balance of payments models as analyzed previously in chapter 6.

In general the explanatory variables of the balance of payments models perform acceptably for the period under study. ΔD variable has a positive effect on the level of ΔTB of the

Absorption model, but a negative impact on the level of ΔR and K of the Reserve and Capital models respectively as theorized (although some of the parameter coefficients are not significant). The Reserve and Capital models are less robust compared to Elasticities and Absorption models in terms of theoretical signs, goodness of fit, and the significance of coefficients. It seems that a different conclusion with regard to the performance of the Capital model is reached by using RMSE and MAPE criteria. Nonetheless as discussed previously, in general the Elasticities and Absorption models are more robust compared with the others. The results taken together suggest that the Indonesian balance of payments experience has been broadly in conformity to the AABP and the EABP hypotheses. This finding may be due to the fact that the balance of payments transactions in Indonesia as a developing economy mostly dominated by current transaction as theorized by the Elasticities and the Absorption models.

APPENDIX 7A - the EABP results

Export Function of 7.2.1.3. OLSQ

$R^2 = 0.83$; $F = 35.14$; $\sigma = 1345.60$ $ML = -183.93$; $DW = 2.03$	
Autocorrelation	$F(1,17) = 0.31$
Functional Form	$F(1,17) = 0.56$
Normality	$\chi^2(2) = 3.31$
Heteroscedasticity	$F(1,20) = 0.39$

Export Function of 7.2.1.4. LIML

$R^2 = 0.80$; $F = 24.49$; $\sigma = 1057$ $ML = -182.29$; $DW = 2.13$	
Autocorrelation	$F(1,17) = 0.42$
Functional Form	$F(1,17) = 1.22$
Normality	$\chi^2(2) = 1.12$
Heteroscedasticity	$F(1,20) = 0.25$

Import Function of 7.2.1.5. OLSQ

$R^2 = 0.77$; $F = 27.74$; $\sigma = 1075.67$ $ML = -171.77$; $DW = 2.11$	
Autocorrelation	$F(1,17) = 0.17$
Functional Form	$F(1,17) = 0.76$
Normality	$\chi^2(2) = 2.51$
Heteroscedasticity	$F(1,20) = 7.42$

Import Function of 7.2.1.6. LIML

$R^2 = 0.86$; $F = 26.49$; $\sigma = 1657$ $ML = -186.26$; $DW = 2.16$	
Autocorrelation	$F(1,17) = 0.62$
Functional Form	$F(1,17) = 1.26$
Normality	$\chi^2(2) = 1.62$
Heteroscedasticity	$F(1,20) = 0.26$

APPENDIX 7B - the AABP results

Absorption Function of 7.2.2.2. OLSQ

$R^2 = 0.84$; $F = 24.44$; $\sigma = 1044.44$ $ML = -181.43$; $DW = 2.02$	
Autocorrelation	$F(1,17) = 0.41$
Functional Form	$F(1,17) = 0.54$
Normality	$\chi^2(2) = 6.41$
Heteroscedasticity	$F(1,20) = 0.49$

Absorption Function of 7.2.2.3. OLSQ

$R^2 = 0.85$; $F = 25.14$; $\sigma = 1040.60$ $ML = -187.96$; $DW = 2.03$	
Autocorrelation	$F(1,17) = 0.11$
Functional Form	$F(1,17) = 0.56$
Normality	$\chi^2(2) = 4.59$
Heteroscedasticity	$F(1,20) = 0.32$

Absorption Function of 7.2.2.4. LIML

$R^2 = 0.77$; $F = 22.14$; $\sigma = 1145.61$ $ML = -181.96$; $DW = 2.15$	
Autocorrelation	$F(1,17) = 0.11$
Functional Form	$F(1,17) = 0.56$
Normality	$\chi^2(2) = 4.51$
Heteroscedasticity	$F(1,20) = 0.42$

Absorption Function of 7.2.2.5. 2SLSQ

$R^2 = 0.80$; $F = 25.99$; $\sigma = 1057$ $ML = -182.20$; $DW = 2.11$	
Autocorrelation	$F(1,17) = 0.46$
Functional Form	$F(1,17) = 1.62$
Normality	$\chi^2(2) = 1.16$
Heteroscedasticity	$F(1,20) = 0.26$

APPENDIX 7C - the MABP results

Reserve Function of 7.2.3.2. OLSQ

$R^2 = 0.60$; $F = 1.43$; $\sigma = 930.68$ $ML = -133.93$; $DW = 2.22$	
Autocorrelation	$F(1,17) = 0.10$
Functional Form	$F(1,17) = 1.19$
Normality	$\chi^2(2) = 0.00$
Heteroscedasticity	$F(1,20) = 0.11$

Reserve Function of 7.2.3.3. LIML

$R^2 = 0.62$; $F = 2.59$; $\sigma = 919.99$ $ML = -142.20$; $DW = 2.09$	
Autocorrelation	$F(1,17) = 2.42$
Functional Form	$F(1,17) = 1.72$
Normality	$\chi^2(2) = 1.92$
Heteroscedasticity	$F(1,20) = 0.95$

Reserve Function of 7.2.3.4. 2SLSQ

$R^2 = 0.73$; $F = 16.00$; $\sigma = 511.51$ $ML = -166.23$; $DW = 2.00$	
Autocorrelation	$F(1,17) = 0.48$
Functional Form	$F(1,17) = 0.03$
Normality	$\chi^2(2) = 2.05$
Heteroscedasticity	$F(1,20) = 0.17$

APPENDIX 7D - the CMABP results

Capital Function of 7.2.4.2. OLSQ

R ² = 0.52: F = 3.28: σ = 589.75: ML = -160.24: DW = 2.01	
Autocorrelation	F(1,17) = 1.99
Functional Form	F(1,17) = 4.92
Normality	χ^2 (2) = 0.64
Heteroscedasticity	F(1,20) = 0.04

Capital Function of 7.2.4.3. OLSQ

R ² = 0.40: F = 2.49: σ = 657 ML = -152.20: DW = 2.17	
Autocorrelation	F(1,17) = 1.42
Functional Form	F(1,17) = 1.12
Normality	χ^2 (2) = 1.11
Heteroscedasticity	F(1,20) = 1.25

Capital Function of 7.2.4.4. 2SLSQ

R ² = 0.51 : F = 4.77 : σ = 529.94: ML = -157.99: DW = 2.07	
Autocorrelation	F(1,17) = 2.87
Functional Form	F(1,17) = 2.25
Normality	χ^2 (2) = 1.32
Heteroscedasticity	F(1,20) = 1.85

CHAPTER 8

SUMMARY AND CONCLUSIONS

There are five main theoretical approaches which can be applied to the balance of payments, the Elasticities Approach to the Balance of Payments (EABP), the Absorption Approach to the Balance of Payments (AABP), the Monetary Approach to the Balance of Payments (MABP), the Capital Market Approach to the Balance of Payments (CMABP) and the Structural Approach to the Balance of Payments (SABP). The general aim of this study is to examine empirically the above various approaches by employing partial equilibrium analysis such as the Elasticities and the Absorption models and general equilibrium analysis such as the Monetary and the Capital models for the period 1960-1988. The specific aims are to gain a better understanding of the main determinants of the balance of payments in Indonesia, and to provide the Indonesian authorities with both a forecasting tool and model to analyze macropolicy prescriptions for correcting balance of payments disequilibrium. There are several reasons (the rationale of the empirical tests investigated) why the studies are relevant for analysis of Indonesia. The Elasticities or the Absorption model can be employed particularly to analyze the good markets of the balance of payments, while the Reserve or the Capital model focus more on the money and asset markets of the balance of payments. By employing five approaches collectively in analyzing the balance of payments, policy implications can be drawn to alleviate the balance of payments problem in the future since one approach in one sense complement to each other as they explain different elements of the balance balance of payments (for example the EABP explains the specific market for imports and exports, the AABP is for aggregate spending and production in the goods markets, the MABP for

money side of the balance of payments, the CMABP concentrates on the spectrum of assets in the economy while the SABP analyzes the structure production in the economy in relation to the balance of payment.

Since some of the models may well belong to a system of simultaneous equations, both single and simultaneous estimation procedures have been employed to estimate the parameter coefficients. Various estimation procedures such as Ordinary Least Squares (OLSQ), Two Stage Least Squares (2SLSQ), Limited Information Maximum Likelihood (LIML) and Instrumental Variable (IV) were employed to scrutinize the efficiency difference among various techniques. Several statistical tests have also been considered for assessing the competing hypotheses, namely diagnostic tests, forecasting tests, and the Bayesian Discrimination test. Diagnostic tests were undertaken to detect the problems of autocorrelation, heteroscedasticity, multicollinearity, and randomness of the residuals. They involved tests of the non-autocorrelated error assumption by using the Lagrange Multiplier test, test of functional form of misspecification by using the Ramsey's Reset test, test of randomness of the residuals by using the Normality test, test of variance constancy by using the Heteroscedasticity test, and the Chow test as well as the dummy-variable test to investigate any structural shifts during the sample period. The forecasting test compared each model with a "naive" model (MAPE and RMSE criteria) while a Bayesian Discrimination test employed the Akaike Information Criteria (AIC).

8.1. Summary of Major Findings

The Elasticities Model

The Elasticities model demonstrates some robustness in explanatory terms in the sense that the exports and imports functions were able to explain reasonably well the current transactions fluctuation in the economy as shown by the statistical properties and diagnostic tests. The Elasticities models estimated by different estimation techniques such as OLSQ and LIML yield similar results. In addition most functions pass diagnostic tests adequately.

The SR price elasticities of imports demand turn out to be very inelastic ($\eta_m^{SR} = -0.065$, $\eta_m^{LR} = -0.613$); this is credible since Indonesia imports mostly necessities and industrial goods needed for its successive *Pembangunan Lima Tahun*. The quantity imported therefore is likely to be insensitive to price changes. Additionally Indonesia does not yet have many well-developed import competing industries. The SR income elasticity of imports is 0.217 and the LR 2.047 whereas the SR world income elasticity of exports is 0.070 and the LR is 0.317. These income elasticity of demand for Indonesia's exports are only a small fraction of the income elasticity of imports or the income elasticity of import demand is considerably more elastic than that of export demand implying that Indonesia has a relatively high propensity to imports in contrast to the world demand for Indonesia's exports. These disparities in income elasticities of import and export demand indicates that the main problem of Indonesia's trade balance requires real economic policies of a structural nature in the economy. The domestic capacity utilization and relative export price also appear to be significant in explaining the movement of export supply in the economy. The adjustment lags (0.558) imply about 56% of the discrepancy between the desired and actual export supply is eliminated in a year, the quantity of exports supplied reacted slowly to the changes in the domestic capacity utilization indicating the country's structural problem unabling it to switch resources into production. Compared to the adjustments of import demand (90%), the adjustment of export supply is

considerably lower. This difference of the adjustment process explains why Indonesia has experienced trade problems since the last decade.

The necessary condition of Marshall-Lerner is not satisfied in the SR, it is fulfilled in the LR but only minimally ! But the necessary condition is not sufficient for devaluation to improve the trade balance. In fact the sufficient condition of Marshall-Lerner shows that in the SR, the trade balance ameliorates but deteriorates in the LR, thus a reverse "J-curve" effect is suggested ! Overall the results show that the economy has relatively low price elasticities of exports and imports indicating that the relative prices do not play an important role in the Indonesian merchandise trade balance mechanism. On the one hand, because of the low price elasticity of import demand, the quantity of goods imported is reduced only slightly causing the demand curve for foreign exchange to be inelastic. On the other hand, because of the low price elasticity of export demand, the quantity of goods exported is improved only slightly. Devaluation therefore fails to eliminate the excess demand for foreign currency.

In estimating the above price elasticities of imports and exports, it is assumed that domestic price level were constant (no "pass-through" effect). To examine the transmission of the exchange-rate onto domestic prices and the transmission of import prices onto domestic prices, a "pass-through" function was estimated. The results show that exchange rate has a significant effect on the domestic price level; almost a half of any 10% devaluation will be transmitted to higher domestic price level. This significance of the coefficient reveals that it is difficult to sustain domestic price changes due to devaluation. Indonesia's devaluations, therefore, induced higher domestic price thereby accelerating inflation. Accordingly the benefit of the price effects on the imports and exports induced

by the devaluation was negated by inflationary effects of the devaluation.

In the light of these results, Indonesia's weak trade balance is progressively seen as a structural problem related to the capacity to produce and to the characteristics of goods exported which are not answerable singularly to devaluation; the payments difficulties in fact originate from the supply side and non-price factors as the evidence of structural rigidity. The phenomena may explain why Indonesia has been hampered with balance of payments problems since the last decade. An improvement in the competitiveness via the devaluations cannot cure the balance of payments disequilibrium permanently to counteract the adverse structural factor in the economy. Suharto's devaluations therefore are not only inflationary but also ineffective in correcting the balance of payments in the long run due to the low trade elasticities and structural rigidity in the economy. Devaluation therefore fails to eliminate the excess demand for foreign currency. As a result, the quantity of foreign exchange required to pay for the imports is reduced by only a small amount. This explains why the Authorities have undertaken successive devaluations to counteract the loss in the foreign exchange reserves throughout the year 1968, 1973, 1978, 1983, 1985 and 1987.

The Absorption Model

The overall performance of the Absorption model is satisfactory in terms of theoretical plausibility, the significance, the magnitude of the parameters coefficients, and the explanatory power of the variables. The absorption variable, rather than income variable, contributes most to the explanatory power of the trade balance equation. Domestic

credit variable also seems to exert significant and positive effects on the trade balance while higher absorption in the economy is associated significantly with the trade balance deficit as predicted by the AABP theory. The parameter coefficients of the Absorption model estimated by single-estimation procedures of OLSQ and LIML are not significantly different from each other. Efficiency is not acquired by using the simultaneous-estimation procedure of 2SLSQ. The estimates of 2SLSQ in fact yield a higher standard error. This suggests that there is not any simultaneity problem in the Absorption model. Accordingly single-estimation techniques such as OLSQ and LIML are preferred to the simultaneous one for estimating the model. This fact is also supported by the results of the Wu test which reveals that the hypothesis of exogeneity cannot be rejected for the Absorption model. There are also similarities among the parameter estimates obtained by different instrumental variables.

The magnitude of the coefficient of Marginal Propensity to Absorb (MPA) is relatively high ($=-1.2$) indicating that the economy has been absorbing more than it produces. MPA which consists of Marginal Propensity to Consume (MPC), Marginal Propensity to Invest (MPI) and Marginal Propensity to Undertake Government Expenditure (MPGE) is dominated by MPC and MPI. The effects of a devaluation on the trade balance depend partly on the magnitude of MPA. If MPA is less than one, some hoarding will materialize consequently the trade balance will improve. Since MPA is larger than one, a devaluation will have a negative effect on the balance of trade because the induced effect on absorption will be larger than the original effect on production. This phenomena may explain that the balance of payments problems in the economy to some extent was caused by relatively high spending in the economy (high MPA) which leaked to import (high MPM).

The Reserve Model

Since there are several version of the Reserve models, this section summarizes the results of the Aghevli-Khan (AK) model as well as the replication of the Zecher-Genberg model, the Bean model, the Uddin model, the Connoly-Taylor model, the Guitian Model, the Edward model, and the Spanos-Taylor model. A likelihood ratio test (LR) was used to determine whether the restricted models produce the same result as the unrestricted ones for 1967-1988. The result reveals that the assumption of homogeneity in prices can not be rejected. Additionally the restricted specifications are superior to the unrestricted ones in terms of their statistical performances. Compared to estimates of the single equations, efficiency is gained by employing 2SLSQ procedure. The Wu test shows that the hypothesis of exogeneity cannot be rejected. The major prediction of the MABP theory that the domestic-credit coefficient should be negative appears to be verified in all models for 1967-1988. However the coefficient seems to be relatively low in the range of -0.200 to -0.300 compared with the theorized value of minus unity. Only the Uddin model generates a significant domestic-credit coefficient of -1.140 being in line with the MABP hypothesis. The domestic interest-rate variable performs poorly for all models. It is credible since most of the years, particularly during 1960s and 1970s the nominal interest rate stays flat; it was administratively determined by the Authorities rather than market determined, however, this interest rate has been left to market forces after the restoration of the economy in 1974 by the *Orde Baru* government. When all Reserve models were estimated for the whole period 1960-1988, the statistical results indicate that the relationship between dependent and independent variables in most of the models underwent a structural change. The models perform poorly when applied for the whole year of 1960-1988, only the Connoly-Taylor model and the Guitian model passed the stability test.

The result of AK model for 1967-1988 shows that not all estimated coefficients conform to the MABP hypothesis. Two estimated coefficients, the income and the inflation elasticities of international reserve, have the wrong sign. The income coefficient appears to be negative and significant; this does not confirm the MABP hypothesis that the balance of payments and economic growth will always synchronize. Paradoxically the result is more in line with the traditional Keynesian AABP hypothesis that an expansion in the real income will spill over to imports cutting down the foreign exchange reserve thereby deteriorating the balance of payments. This phenomena may explain the negative association between the real income and the foreign exchange reserve in the period of 1967-1988. The positive sign on the estimated inflation variable is also not consistent with the MABP proposition; in fact an increase in the growth of inflation raised the money demand through the direct effect of higher prices outweighing the indirect effect of the rising opportunity cost of holding money. This in turn improves the balance of payments. This finding is reinforced by previous studies in less developed countries where the expected rate of inflation is observed as a major variable in escalating the money demand. The inflation variable, with the highest partial correlation coefficient contributes most to the explanatory power of the AK model, highlights the importance of the inflation variable in terms of determining foreign exchange reserve flows. Overall, there still appears to be sufficient evidence to suggest the applicability of the MABP theory to the economy for the years 1974-1988. Although all estimated coefficients of the models do not yield the signs as expected by the MABP theory, the finding of the AK model indicates that the offset coefficient ($=-1.078$) is significantly equal to the hypothesized value of minus one. However the significant influences on the foreign reserves fluctuations for 1974-1988 seem only to be from the inflation, domestic credit and income variables, whereas for 1967-1988 all estimated parameter coefficients have the

expected signs but only the price variable appears to be statistically significant. Except for inflation, the other estimated coefficients, although they have the right signs, are not significant. The overall F value allows us to accept the hypothesis that the growth in real income, in prices, in inflation, in domestic credit, in money multiplier, and in domestic interest rate influenced significantly the growth in international reserves during 1974-1988. The sign of estimated price elasticity of foreign exchange reserves is in conformity with the MABP theory; an increase in the price level will lead to a desire by the domestic residents to restore the real value of their cash balances, and an improvement in the balance of payments (via increased reserves). However the size of the price elasticity is unexpectedly large; three times larger than the theorized value. This high price elasticity may be due to the fact that the economy was characterized by accelerating inflation in the presence of a "cheap money" policy and successive devaluations.

Empirical results of the Guitian model for 1967-1988 indicate that the offset coefficients are statistically significant indicating a negative relationship between domestic credit expansion and change in foreign exchange reserves. The offset coefficients estimated by the single-estimation techniques are between -0.200 and -0.320. This coefficient jumps to -2.018 when estimated by the simultaneous equation technique of 2SLSQ. An offset coefficient greater than minus unity indicates over sterilization. This occurred during an oil boom; the country experiencing large increases in foreign exchange reserves which the Authorities monetized. The huge expansions of domestic credit lead to higher spending which in turn leaked to imports. Subsequently the Authorities had to undertake further devaluations in response to the resulting loss of the reserves. Since the government has consistently increased domestic credit expansion, the outcome has been double digit inflation in

the economy and as a result the magnitude of the price coefficient is relatively large.

The Capital Model

The statistical tests suggest that capital flight was an important phenomenon in Indonesia before 1968 and after 1979. Between 1969-1978, however, capital inflows were observed. The analysis reveals that there is a complex array of factors which cause capital flight. It seems that political chaos, change in government regime, high inflationary economy, fiscal deficits, the fear of devaluation and high world interest rate were the primary causes of capital flight; the capital flight materialized because investors transferred their capital abroad in search of lower risks, higher return and safety considerations. Moreover the relative openness of the financial market facilitated capital flight by residents who lacked confidence in the domestic financial market. Whereas capital inflows were associated with high domestic interest rates during the stabilization period. The study also reveals unstable relationships between movements in capital flows and world interest rates, current balance, changes in domestic credit, changes in domestic income, and changes in exchange-rate. The changes in the nature of capital movements might be due to the liberalization of the financial market and the economy after the 1965 revolution. After the structural break in 1977, the overall explanatory power of the model performance had changed considerably, for example an increase in the world interest rate and increased expectation of devaluation would motivate capital outflows before exchange rate changes. In addition an increase in the domestic credit or the monetary base would be significantly offset by an outflow of capital. Although the model explains significantly the capital

movements in Indonesia for the period 1960-1988, the estimates of the equation for all periods do not appear to be consistent with the CMABP hypothesis in terms of the expected sign, particularly the coefficients on domestic credit and income. The negative value of the income coefficient for example implies that economic growth associated with capital outflows contributed to the deterioration of the balance of payments. This is not in line with the CMABP hypothesis itself. In addition the parameter coefficients of the reaction functions were not significant, suggesting that sterilization of the capital flows did not present.

Overall Performance for 1967-1988

Most balance of payments models, except for the Capital model, for the period of the *Orde Baru* (1967-1988) appear to be adequate in terms of the statistical performance. The estimates of the balance of payments models for the period 1966-1985 and those of 1967-1988 do not differ significantly in both the magnitude of the coefficients and the significance of the parameters. The results of the single-equation estimations are relatively similar to those of the simultaneous procedures, moreover the absence of efficiency gained by simultaneous procedures implies the superiority of the single-estimation techniques.

The Reserve and the Capital models are less robust compared to the Elasticities and the Absorption models in terms of theoretical signs, goodness of fit, and the significance of coefficients. This finding is credible since the balance of payments transaction in a developing economy is mostly dominated by the current account transactions as theorized by the Elasticities and the Absorption approaches. It appears that

the Bayesian Discrimination (AIC) and the Forecasting (MAPE and RMSE) statistics support the implied statistical decision that the Elasticities and the Absorption models outperform the others for forecasting the particular aspects of the balance of payments involved. However since the models analyze different elements of the balance of payments, they can be viewed as complementary rather than competitive for policy purposes.

8.2. Macropolicy Implications

The Elasticities and Structural Models

The results indicate that the sufficient Marshall-Lerner condition is not satisfied; the exports and imports are relatively insensitive to price changes. This may be due to the composition of imports, which comprise mostly capital and machinery goods and which do not have any domestic substitutes. Exports also appear to be price inelastic since they consist mostly of primary goods. Thus, the devaluations were not successful since the price elasticities of supply exports and demand for imports have not been large enough for the increase in exports and the reduction in imports to offset the terms of trade loss. Consequently Indonesia's foreign exchange receipts have fallen following devaluations and the balance of payments have deteriorated. The evidence of the "Houthakker-Magee" effect in the economy also indicates that the main problem of Indonesia's trade balance requires real economic policies of a structural nature in the economy such as secondary outward-looking policies (promoting manufactured exports, switching the export structure from primary products towards manufacturing products), changing the ownership of factors production, and shifting domestic and foreign resources into the traded goods sector. Industrialization policies designed to work straight on manufactured exports, however,

will be more efficient such as concentrating on the type of goods exported on individual sectors of the economy within the product range like quality, reliability, maintenance and marketing. Since the country also has a relatively high income elasticity of imports, selective exchange controls can be imposed on both current and capital transactions since it can exert direct effect on imports. The discrimination will be exercised against the importation of luxury and non-essential consumer goods since MPA (which consists of Marginal Propensity to Consume or $MPC=0.714$, Marginal Propensity to Invest or $MPI=0.301$ and Marginal Propensity to Undertake Government Expenditure or $MPGE=0.217$) is dominated by MPC.

Indonesia has experienced permanent difficulty in reconciling balance of payments equilibrium and devaluation has been prevalent in reconciling the conflict. According to the Structural Approach, Indonesia's balance of payments should be viewed in a growth context in a sense that the real problem of the economy is the slow growth of exports which cannot be raised permanently by devaluation and is not responsive to just monetary manipulation. The solution requires real economic policies of a structural nature related to the wider characteristic of merchandise such as its quality design, reliability, marketing, distribution and delivery. Devaluation simply freezes the industrial structure, and makes the traded goods just temporarily competitive in the exports of goods with given characteristics which are the source of the weakness in the first place. Indonesia's poor economic performance relating to other developing countries is predominantly a function of its balance of payments caused by the slow growth of exports relative to others. Unless this weakness is remedied Indonesia will be destined to a low growth rate with rising unemployment regardless what economic policies are employed.

The Absorption Model

The results indicate a high Marginal Propensity to Absorb (MPA). The successive devaluations were not successful because absorption in the economy increased marginally more than its output of goods and services; devaluation tended not to close the gap between domestic output and absorption to widen. After several devaluations, the economy still experienced high Marginal Propensity to Absorb; the devaluations in fact did not induce reduced absorption. Unless absorption declines relative to production, the trade balance deficit shall persist. Devaluation may be necessary to reduce the deficit, however, excess demand apparently remains in the economy after the devaluations since the main cause was "overabsorption". Hence the competitive improvement due to the devaluations were negated by subsequent increase in total absorption and imports without any reduction of the previous deficit. To achieve external balance, the Authorities have to combine expenditure switching policy with financial discipline and tight monetary policy (such as credit control and high domestic interest rate) to guarantee that in the long run aggregate demand does not go beyond aggregate supply. Since MPA which consists of $MPC=0.714$, $MPI=0.301$ and $MPGE=0.217$) is dominated by MPC, the Authorities need therefore to regulate spending particularly of the private sector by exercising investment incentives and taxation. However this must be complemented by structural macropolicies which lead to industrialization and a reallocation of resources or sectoral diversification away from dependence on primary products.

The Reserve Model

The Reserve model strongly suggest significant monetary influences on the balance of payments; the offset coefficient is statistically significant indicating a negative relationship between domestic credit expansion and change in foreign exchange reserves. This in turn has important policy implications; an increase in the domestic element of the high-powered money via domestic credit, by either the Bank of Indonesia or commercial banks, will affect the balance of payments. It follows that a continuous balance of payments deficit in the economy occurred partly because of the amplification of domestic credit particularly in the period of 1974-1988. Indonesia could not achieve any permanent expansion of domestic credit without hazarding its balance of payments. Thus, to counteract a lasting deterioration in the balance of payments, any escalation in domestic credit in one period must be offset by a diminution in domestic credit in the subsequent period. This suggests that monetary policy namely the management of domestic credit (such as selective credit control) should be used to attain the desired stock of international reserves or the balance-of-payments target. The Authorities should adopt tighter and less accommodating monetary policies in the future to prevent balance of payments problems and to dampen the inflationary effect of devaluations.

The Capital Model

The results indicate that capital flight was an important phenomenon in Indonesia before 1968 and after 1979. Between 1969-1978, however, capital inflows were observed. The analysis reveals that there is a complex array of factors which cause capital flight such as political chaos, high inflationary

economy, fiscal deficits, the fear of devaluation and high world interest rate; an increase in the world interest rate and increased expectation of devaluation would motivate capital outflows before exchange rate changes. Whereas capital inflows were associated with high domestic interest rates during the stabilization period. The disequilibrium in the country creates strong incentives for capital flight. The Authorities should try to change existing incentives in the economy by liberalizing capital imports, reforming domestic financial intermediation to make it less dependent on government intervention, maintaining relatively high interest rate (as long as domestic interest rates continued high relative to world rates, the capital account would indicate a reduced deficit), targeting domestic credit expansion and reforming tax-exemption to place funds in Indonesia, thus direct foreign resources toward expanding the economy.

8.3. Suggestions for Future Research

Further empirical research into Indonesia's balance of payments could be undertaken if data for a long time series and with greater disaggregation were available.

- It would be interesting to examine in more detail not only the "aggregate" elasticities of exports and imports but also the elasticities of exports and imports for less disaggregated data and for specific commodities.

- Since the balance of payments models analyze different elements of the balance of payments, they can be viewed to some extent as complementary models. It is believed that the avenue of future research may involve the combining of valid elements or explanatory variables of the balance of payments by employing "the Encompassing Principle" (Hendry-Mizon

1982). The all encompassing model will become the "true" balance of payments model for an economy if it can explain the data better than other specific models.

- Traditional statistical tests may lead one to accept the existence of relationship between regressand and regressors when this is in fact spurious (Granger-Newbold 1974). Future research should examine whether the regressand and the regressors of the balance of payments models move together in the long run and whether the stationarity condition is satisfied. This would require the use of "Cointegration Techniques" (Eangle-Granger 1987, Phillip-Durlauf 1986). Again larger data sets will be required.

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