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Generalized purchasing power parity, real exchange rates, and structural changes in the Indonesian economy

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This work is dedicated to my family. First is to my father, Lodewijk Lumban Gaol, who always encourages his children to appreciate the value of education and learning. Second is to the memory of my mother, Annur Aruan, who always prayed for her children. Finally is to my wife, Nur Intan and children, Christie and Sarah, for their patience and support.

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CHAPTER 1. INTRODUCTION

The large variability of real exchange rates since the collapse of the Bretton Wood system has motivated investigation about the validity of purchasing power parity (PPP). The important question is whether real exchange rate series have behaved according to the PPP theory of real exchange rates. According to the long-run version of PPP theory, the level of a real exchange rate is characterized by a white noise process. That is, any deviation of the real exchange rate from its constant equilibrium level should be completely random. Therefore, if the real exchange rate behaves as suggested by PPP theory, any deviation of the actual real exchange rate from its PPP level will reflect a deviation from its long-run equilibrium level.

The attempt to study the validity of PPP theory has also been initiated based on the poor performance of modern structural models of exchange rate determination. As one important building block for these models, PPP has become the focus of studies to explain the failure of the models.

Studies of PPP have give mixed results-some studies support PPP, and others show departures from PPP. Purchasing power disparities can be explained through structural and transitory departures. Whereas structural departures from PPP explain the cause of change in the equilibrium relative price, transitory deviations are usually the result of the differential adjustment speeds of prices in the goods and assets markets. The existence of nontradable goods and differences in productivity, growth, and market structure are examples of sources

of structural deviation from PPP. In addition to these deviations, econometric misspesification can result in misleading PPP estimates.

In light of the mixed empirical findings that consist of both acceptance and rejection of PPP, it is important to consider the time-series properties of such deviations and of the variables themselves. Some studies conducted before the development of the unit root test (Dickey and Fuller, 1979, 1981) and Nelson and Plosser's (1982) seminal paper, ignore the time-series properties of the variables examined. However, if these deviations are stationary, they have a temporary character, whereas nonstationary deviations from macroeconomic relationships have a permanent effect. This implies that when deviations are temporary, it is still possible to have a long-run relationship. This concept is relevant to the case of PPP as a long-run phenomenon (Mussa, 1979).

The absolute and relative versions of PPP are specified as linear combinations of generally nonstationary variable. A linear combination of non stationary variables could be either stationary or nonstationary. If a combination of PPP forcing variables is stationary, however, a case for long-run relationship can be made. The variables are said to be cointegrated when a stationary relationship exists (Granger, 1981). The cointegration test was developed by Engle and Granger (1987), and some empirical studies have applied this method in testing the validity of PPP.

A univariate framework of empirical study in the case of PPP may lead to misspesification because it ignores the international interdependency issue (Hakkio, 1984; Abuaf and Jorion, 1990). Hakkio (1984) has suggested that we estimate PPP using a system

estimation to account for correlation within countries. Abuaf and Jorion used generalized least squares, such as the seemingly unrelated regression estimation method, instead of the univariate framework used by Adler and Lehman (1983). The two studies reported different results using the same data.

The availability of cointegration methods in multivariate analyses such as those developed by Stock and Watson (1988), Johansen (1988), and Johansen and Juselius (1990) allows further study of PPP. The issue of cointegration among both univariate and multilateral real exchange rates becomes possible to investigate.

Recently, Enders and Hurn (1991a, 1991b) developed the theory of Generalized-PPP based on the time-series properties of real fundamental macroeconomic variables, determining real exchange rate, and the international interdependency among a group of countries that leads to a currency area. The theory is consistent with standard open-economy macroeconomic models, and the condition for long run relationships among real exchange rate was derived. The Generalized-PPP relationship offers the notion that the real exchange rate between two countries is the weighted average of the real exchange rates of the other countries within the currency area where the weights are not traditional "trade weights."

Structural change is a major concern in economics. Such change is manifested as parameter shifts in the economic system. Within macroeconomics, the so-called Lucas critique argues for parameter changes. The idea is that the parameters of macroeconomic models will be determined by the expectations of economic agents involved in concerning

future economic policy. If policy changes, so do the expectations and related parameters. The significance of the change and when it occurred must be identified.

In the regression model framework, the change in one or more of the parameters indicates structural change. Misspecification problems based on the problem of structural breaks have been related to the unit root test. Most empirical studies examining the validity of PPP or real exchange rates do not account for these structural breaks. The methods developed by Dickey and Fuller (1979, 1981) and Phillips and Perron (1988) are not able to detect such problems (Henry and Neadle, 1990; Perron, 1989). All have argued that there is a need to develop alternative statistical procedures that can distinguish a process with a unit root from a stationary series around a deterministic function with a break. Perron (1989, 1990, 1991) developed a formal statistical test of the null hypothesis for the unit root for such a problem in the spirit of "intervention analysis." This test, however, precedes the knowledge of structural break. In the case of unknown or even known policy change, identification of a structural break is important.

The dynamic interaction among real exchange rates in a global economy has been studied using the vector autoregressive representation (VAR) method developed by Sims (1980), despite the fact that many economists have objections about VAR methods. One such objection addresses the availability of standard measurements such as confidence interval of impulse response and standard error in forecasting error variance decomposition, which leads to the question of result interpretations (Cambell and Mankiw, 1987; Cohrane, 1988). One reason for the lack of estimation measurement, as argued by Lutkepohl (1990), is the problem

of relevant asymptotic distribution of impulse response functions and forecast error variance decomposition of the VAR model. The availability of such asymptotic distributions can facilitate the computation of standard error and test statistics.

Most studies about PPP and real exchange rates have related to developed countries. The presumption that initiated this trend is that PPP works well in a relatively free market economy. However, the concept of PPP does not necessarily apply only to developed countries. The members of the Association of Southeast Asian Nations (ASEAN)--Brunei, Indonesia, Malaysia, the Philippines, Singapore and Thailand--practice relatively free trade. Besides, these countries represent rapidly growing economies with strong trading ties to industrial countries such as Germany, Japan, and the United States. As a group, ASEAN members have considered regional trade arrangements in recent years. Industrial cooperation, even though limited, has been implemented. Recent initiatives for the existing ASEAN free trade area (ASEAN-FTA) have been negotiated intensively. Thus, there are strong justifications for further study of Generalized-PPP relationships among this group of countries.

The primary objective of this research is to investigate the existence of Generalized-PPP in the presence of structural change for the ASEAN countries, the ASEAN countries as a group and each major trading partner, and the major trading partners and each of the ASEAN countries. The second objective is to study the short-run dynamics of Generalized-PPP and the interrelationships among real exchange rates in the system.

Chapter 2 reviews the Indonesian economy and discusses the implication of specific structural changes in Indonesia. The starting point for the structural changes described in this Chapter. Starting point of the change can be considered as a point of structural break for the Indonesian economy. Chapter 3 reviews the literature on PPP, Generalized-PPP, and related empirical studies. Chapter 4 reviews the unit root and cointegration tests in the presence of structural change. These method are then applied to investigate the validity of PPP and Generalized PPP. Chapter 5 presents an estimation of the short-run dynamics of Generalized-PPP and analyzes the interrelationships among real exchange rates in the currency area. Finally, Chapter 6 provides some concluding remarks and discusses a topic for further research.

CHAPTER 2. THE INDONESIAN ECONOMY AND STRUCTURAL CHANGE

Since declaring independence on August 17, 1945, Indonesia has been governed by two regimes with widely differing approaches to pursuing economic development. The Soekarno government left with problems from Dutch and Japanense colonization, tried to reach full national integration in the beginning of its term and to obtain recognition from other nations. The Soekarno government focused on political rather than economic issues. The economy was regulated by strong government intervention, and the important roles given to stateowned enterprises served to reinforce a strong inward economic orientation.

The New Order government of President Soeharto faced severe economic problems when it came to power in 1966. These problems included a contracting economy, a large and inefficient public sector, high external debt, spiraling inflation, and falling levels of private investment. Annual per capita income was approximately US $50.00. The New Order government moved to restore Indonesia's economy. As the Soeharto government strengthened its position, a new set of economic priorities emerged in various policy statements. Together with the restoration of monetary and fiscal stability, the government encouraged foreign and domestic private investment, especially in the manufacturing and mining sectors. The Foreign Investment Law and Domestic Investment Law were implemented in January 1967 and November 1968, respectively. In addition, the government rejoined international institutions such as the United Nation, the International Monetary Fund,

and the World Bank, after having withdrawn from these organizations for several years during the Soekarno regime.

Another important feature of Soeharto's New Order government has been the implementation of five-year development plans, called REPELITA (*Rencana Pembangunan Lima Tahun*), starting in fiscal year (FY)1969/70. Each plan is based on the Guidelines of State Policies, called *Garis-Garis Besar Haluan Negara*, and is adopted by the People's Consultative Assembly in their first meeting every five years after the national election. Each plan specifies development objectives, policies, programs, and projects for the next five-year period. The initial step for implementing a five-year plan is government submission of the annual budget, which should fit within the detailed operational plan for carrying out programs and projects. The process of submitting an annual budget allows annual review of development activities, projection of resources, and budget allocations for adjustments and improvements of the current five-year plan. The New Order government also introduced the harmonization of growth, equity, and stability, often referred to as the Trilogy of Development, to be the fundamental principle guiding development policy.

The New Order government's economic policies, combined with the effects of an increase in oil prices, led to a significant change in the structure of the Indonesian economy compared with the economic regime under the Soekarno government. These structural changes have also affected patterns of government expenditure, private expenditure, and level of investment, which reflect both the effects of foreign investment and high levels of foreign aid.

During the period in which President Soeharto has been firmly in control, both changes and continuities are striking. Because the changes are many, five examples will be explored. One of the most important economic changes in the first decade of Soeharto's regime was the rapid introduction and adoption of new technologies in a broad range of economic activities and the impact of these technologies. In agriculture, the advent of the Soeharto regime coincided with the green revolution, which has affected Indonesia mainly through its impact on rice cultivation. In various non-agricultural pursuits, which have traditionally provided employment for the rural population, the impact of technological change has also been substantial.

The second of the institutional changes was implementation of the rice intensification programs. Under the New Order government in the late 1960s and early 1970s, major emphasis was given to increasing rice production and improving marketing. The rice intensification programs included direct price and quantity control over both inputs and the rice output market.

A third striking contrast between the Soekarno and Soeharto regimes is in the attitudes of government officials toward development priorities. In the period between 1958 and 1965 under Soekarno, the balance of power in the economy began to shift to groups supporting rapid eradication of capitalism. The emphasis was on eliminating colonial institutions and transforming the economy toward socialism, where the public sector was dominant. In contrast, officials under the Soeharto regime have emphasized economic priorities such as increasing production and income. There is no more talk of the political transformation of

colonial institutions and no emphasis on purely redistributional policies such as land reform or nationalization of foreign-owned companies. Another important change in official attitudes concerns foreign investment. Since 1966, Indonesia has swung away from the inward-looking attitude that depends upon public enterprise and has endeavored to adopt at least some policies favoring private entrepreneurship.

Through the 1950s and 1960s, the planning and implementation of economic policy in Indonesia was greatly hampered by recurrent balance-of-payment (BOP) problems. In the late 1960s, inflows of foreign aid and investment eased Indonesia's position. Then, in 1972 and 1973, a commodity boom followed the oil boom and dramatically changed the situation. This change in Indonesia's external position, which for several years has been one of comparative strength, marks the fourth major change from the Soekarno regime. The improvement in BOP in the beginning of the Soeharto regime has had important implications for long-term development.

Lastly, the ability of Soeharto's New Order government to perform internal economic management is in full contrast to that of the previous regime. Extraordinarily unstable fiscal and monetary policies between 1958 and 1965 causedsubstantial long-term damage to the Indonesian economy by forcing economic agents to make decisions on a very short-term basis. With the help of foreign aid and the oil boom, the Soeharto government managed to build confidence in its ability to control monetary and fiscal policies -- an important economic achievement. Much of this confidence is due to the very substantial backing received through

the Inter-Governmental Group of Indonesia from the major industrial countries, and from the World Bank and the International Monetary Fund.

Following this review of the reforms introduced by Soeharto's New Order government in response to problems inherited from the Soekarno regime, changes that have occurred during the Soeharto regime will be discussed. The next section provides a detailed description of policy reforms undertaken to restructure the Indonesian economy in response to the economic recession in the 1980s. The subsequent section reviews Indonesia's economic performance and focuses on the effects of policy reforms on the economy. The final section of this chapter presents a summary and some conclusions.

Policy Changes During the Soeharto Regime

After experiencing rapid growth in income, consumption, and investment during the 1970s stemming from the oil and gas boom, Indonesia faced a much worse external environment beginning in 1983. The decline in oil prices caused grave problems in the Indonesian economy because oil and gas accounted for 82 percent of export earnings and 71 percent of government revenue in FY 1981/82. In addition, the worldwide recession in the early 1980s affected the Indonesian economy because most of Indonesia's debt was in currencies that appreciated against the US dollar. The depreciation of the US dollar, combined with lower oil and gas prices, contributed to the rapid increase in Indonesia's debt service burden.

In response this challenge, the government implemented a broad range of macroeconomic stabilization and structural adjustment measures starting in 1983. The measures can be divided into two broad types of policies. The first dealt with the issue of restoring financial stability. In this case, the government implemented austere macroeconomic policies. The second policy reform dealt with sustaining the momentum of development over the medium to longer term. Within this policy reform, the government adopted a program to restructure the economy in order to reduce its heavy dependence on oil and gas as a source of foreign exchange and budgetary revenues and to improve Indonesia's economic efficiency, while at the same time to moving toward an export-oriented economy.

The specific policy reforms, however, can be categorized into four groups. First, an active exchange rate management policy has been adopted to restore BOP stability and to sustain growth over the medium term. Major devaluations were taken and the flexibility of the exchange rate was improved by moving the system to a more actively managed float. A number of strong fiscal policy reforms were adopted to constrain public expenditure, mobilize public revenue, and reduce the overall budget deficit. These monetary and financial policy reforms were implemented to accommodate inflationary pressures, prevent capital flight, mobilize financial resources, and improve the efficiency of the use of financial resources. Series of trade and other structural reforms, such as investment regulation, were introduced to help diversify sources of foreign exchange earnings and to make possible a recovery of economic growth over the medium term.

Exchange Rate Management

The dependence of Indonesia's foreign exchange earnings and government revenue receipts on oil and gas exports brought with it two major problems. First, the instability of international petroleum prices caused instability in export earnings and government revenue, leading to significant problems of short-term macroeconomic adjustment. Second, domestic absorption of oil and gas export earnings produced structural problems within the Indonesian economy. To contend with these problems, one of the major policy adjustment components is exchange rate policy.

As a small open economy that has adopted a policy of free capital movement since 1971 and implemented free currency convertibility of the rupiah since 1968, Indonesia has experienced changes in the exchange rate system and adjustments in exchange rate. These two factors are central to explaining the structural change in Indonesia's economy.

Change in the Indonesian Exchange Rate System

The choice of an exchange rate system depends upon a country's conditions. Enders and Lapan (1987) haved argued that monetary policy as well as the rate of inflation, wage rigidity, and openness of the country influence the choice of system. With respect to country openness, flexible exchange rates are considered better for a relatively closed economy, whereas fixed exchange rates are deemed preferable for a small open economy.

In their study of changes in foreign exchange rate systems in developing countries, Edwards and Santealla (1993) found that most developing countries continue to adopt a fixed

exchange rate system, despite the collapse of the Bretton Wood system in 1973. These countries are mainly pegging their currencies to a specific country's currency within the spirit of an optimum currency area. During the 1980s and early 1990s, however, some developing countries moved from a fixed exchange rate system to more flexible systems such as a managed exchange rate system. This movement was associated with the debt crisis in 1982.

Indonesia has experienced both fixed and managed floating exchange rate systems. From 1971 until 1978, the value of the rupiah was pegged to the US dollar in a fixed exchange rate system. The system moved to a tightly managed float in November 1978, and to a more flexible but still managed float in March 1983. The current system, introduced in April 1988, combines a managed float with a gradual adjustment of the rate with respect to the US dollar.

The rationale behind the change from a fixed to a tightly managed floating system in November 1978 was to curb the rate of inflation. From August 1971 to November 1978, the rupiah was pegged to the US dollar in fixed value and was twice devaluated. The high inflation rate in Indonesia before November 1978 caused a decline in the rupiah's purchasing power. In the context of free capital mobility, Indonesia was forced to abandon the fixed exchange rate system. Instead of moving to a flexible exchange rate system, Indonesia chose to move to a tightly managed floating system. Arnt (1978) has argued that the motivation behind this change was the prospect of BOP. It was projected that BOP could be turned around, moving from a huge surplus to stationary or even declining in international reserves. Another argument (Dick, 1979) states that the change was a basis for developing a more

export-oriented economy. Evidence for the latter argument was not clear because the change was not followed by other policy changes; however, the plan might have been discontinued after the second oil shock (increasing oil prices) in FY 1979/80.

The movement to the flexible managed floating system in March 1983 was motivated by experience from using the previous system. The tightly managed floating system was considered a failure in reducing inflationary pressure from the second oil shock in FY 1979/80 (Arnt, 1983). Reasons for this change hace been argued by McCawley (1983) as follows. First, the stability of the Indonesian exchange rate against major currencies that move freely since the collapse of the Bretton Wood system in 1973 is substantially determined by major countries and has little to do with the external condition of Indonesia. Following the argument of a optimum currency area, it could be better for Indonesia to tie the rupiah to a trade-weighted basket rather than to any one of the major currencies alone.

The second consideration concerns to the objectives for managing Indonesia's exchange rate. McCawley has argued that Indonesia was attempting to to maintain an appropriate level of international reserves to provide assistance to industries producing tradable goods and to stabilize domestic prices. In pursuing these objectives, the fixed and the tightly managed floating systems appeared not to be effective. Experience showed that the levels of foreign exchange reserves changed with high variability and the level of competitiveness for tradable goods fluctuated substantially. Another factor was that the oil boom was fueling Indonesia's economy with inflationary pressures.

Exchange Rate Adjustment

The exchange rate has traditionally been considered an important government policy instrument for macroeconomic stability as well as a tool for supporting trade policies. Despite debates on the effectiveness of currency depreciation, devaluation is frequently viewed as a method of improving a country's competitiveness. Improvement in the attractiveness of traded goods causes the level of exports to rise, the level of imports to fall, the trade balance or current account to improve, and domestic employment to increase. The other view is that devaluation generates redistribution of wealth among countries, which leads to an inflow of international reserves. This shift is based on the impact of the develuation on the value of portfolio-holding of wealth such as money, bonds, and stocks.

Indonesia devaluated the rupiah three times within a decade after adopting the managed floting system, despite the flexibility of the system. The first devaluation occured in November 1978 simulateously with the change in the system. The rupiah was devaluated from US $1 equals Rp. 415 to US $1 equals Rp. 625. The second devaluation occured in March 1983 and was introduced concurrently with the movement to the more flexible managed float. The rupiah was devaluated from Rp. 703 to Rp. 970 per US $1. The third devaluation was undertaken in September 1986, when the rupiah was devaluated from Rp. 1,134 to Rp. 1,644 per US $1.

The rationale for the November 1978 devaluation included several objectives. The first objective was to improve non-oil and non-LNG (liquified natural gas) foreign exchange earnings. This objective was associated with the OPEC decision in December 1977 to reduce

oil production as a way to control oil prices. Domestic demand for oil increased, indicating that the heavy dependence on oil and LNG foreign earnings as a main source for financing Indonesia's development should be reconsidered. Second, the competitiveness of tradable goods had declined until late 1978, following the first oil shock in FY 1973/74. This condition was consistent with the so-called Dutch Disease effects of absorbing growing petroleum revenues (Warr, 1992). Thus, the improvement of non-oil and non-LNG exports as a source of foreign exchange earnings faced the same problems. The third objective was to adjust the decline in the purchasing power of the rupiah as a consequence of the fixed exchange rate system in use prior to this devaluation, and the final objective was to remedy BOP (Arnt, 1978).

Dick (1979) has argued that this devaluation was undertaken for reasons in addition to the conventional BOP considerations. According to Dick, the devaluation was intended to encourage structural change, which would provide a higher growth rate of employment by simulating primary non-oil and non-LNG exports, thereby protecting Indonesia's infant manufacturing sector from import competition and encouraging development of an export-oriented economy. Thus, the devaluation was intended to forestall BOP difficulties through the growth of non-oil and non-LNG exports.

Despite an adjustment for moving to the more flexible managed floating system, the BOP considerations seem to have played a greater role in motivating the March 1983 devaluation. Indonesia had experienced heavy external pressures in the two years prior to the devaluation caused by world oil prices and the international recession. Another factor that

contributed to this devaluation was the effectiveness of the November 1978 devaluation. Much of the improvement in the real exchange rate was lost, mostly through accelerating inflation, within twelve months. The rest was lost in the following two years. The competitiveness of tradable goods declined and returned to 1978 levels.

In addition, government budget considerations may have motivated the devaluation. Falling oil prices caused a drastic decline in government receipts from the oil sector. Because there was no other quick alternative to compensate for this loss, the government was forced to devaluate the rupiah before the budget for FY 1983/84 was implemented on April 1, 1983. Preventing more capital outflow may also have contributed to this devaluation. In March 1983 before the devaluation, OPEC decided to cut crude oil prices. In addition to the OPEC decision, projections of oil export volume indicated a downward trend. Both developments were expected to adversely affect foreign exchange earnings and government revenues. This expectation was based on the level of capital outflow during the weeks prior to the devaluation.

It was argued that the September 1986 devaluation took into consideration the current and projected BOP. A sharp decline in Indonesia's oil production was expected to continue following the third oil shock (oil price dropped) in 1986. The decline in terms of trade was expected to deteriorate further. The high cost of the economy and the lack of international competitiveness were other factors that motivated this devaluation. The budgetary implications of the devaluation were not clear; the increase in oil and LNG revenue in terms of the rupiah was offset by the increase in debt service and debt repayment obligations.

Fiscal Policy Changes

During the Soekarno regime, the Indonesian fiscal system was mostly influenced by foreign trade revenue. World trade conditions for Indonesian export commodities, which were mostly agricultural, caused foreign trade revenues to decline as a percentage of total government revenue. Unable to make up for the loss, the government was forced into deficit financing to maintain the desired level of expenditures. This policy led to a process of cumulative inflation and disintegration of the monetized economy.

Viewing the system of the previous regime as a failure, the New Order government set goals that pursued overall objectives regarding stable growth and development. Booth and McCawley (1981) have summarized these goals as follows: (1) balanced budget policy was adopted in the sense that total expenditure would not exceed total revenue from both domestic and foreign sources, including foreign aid in terms of loans and grants; (2) government saving (i.e, domestic revenue minus routine expenditure) were to increase over time to enable gradual reduction of foreign aid in financing development expenditure; (3) the wide progressive tax base was implemented; (4) productive development expenditure was given a higher priority than was routine expenditure or subsidy for state enterprises; and (5) budgetary policy was to allow maximum use of domestic resources (including labor) in expanding domestic output.

The realization of these goals, however, was both aided and impeded by the oil boom during the 1970s. Revenue diversification was not reconciled. The oil tax revenue increased domestic revenue and enabled a growing proportion of development expenditures to be

funded from these revenues. The very rapid growth in oil revenues, however, discouraged collection of non-oil domestic revenues such as income and sales taxes.

The decreasing oil revenue as a result of decreasing world oil prices and increasing domestic demand for oil forced adjustment of fiscal policies in Indonesia. The adjustment policies have taken into consideration the following basic issues: diversification of revenues and efficiency and pattern of expenditure.

Tax Reform Policies

The pre-reform tax system in Indonesia was implemented without fundamental change from Indonesia's independence until the early 1980s. This system was considered inadequate to mobilize domestic revenues. According to Booth (1986) which were reported by Asher and Booth (1992), some characteristics of this tax system were (1) a low ratio of non-oil tax revenue to gross domestic ptoduct (NOTR/GDP), (2) inconsistent enforcement complexity and ambiguities in tax laws, regulation, and procedures, and (4) wide dispersion in effective rates among activities of sectors and products leading to inefficiency in allocation of resources and lack of fairness among individual taxpayers. This system was also highly centralized.

As mentioned, improving domestic government revenues became a necessity for solving the problem of decreasing domestic revenues from the oil tax. Tax reform was needed both to reach this goal and to overcome the deficiencies of the pre-reform tax system. Three years after initiating the tax reform process, the Indonesian Parliament approved three tax laws in December 1983: (1) the General Tax Provisions and Procedures, (2) the Income Tax

Law, and (3) the Value-Added Tax on Goods and Services, and Sales Tax on Luxury Goods (VAT Package). The new income tax law was implemented in January 1984, and the VAT Package was implemented in April 1985. Laws regarding the land and building tax, and the stamp duty were passed in 1985 and implemented in January 1986. Some modifications have been enacted since implementation, especially in the VAT Package.

In general, the objectives of the tax reform were to overcome the weaknesses of the pre-reform tax system. The first specific objective was to improve the role of domestic revenue through tax by increasing the NOTR/GDP ratio. The second objective was to improve the efficiency of the tax law and of the administrative tax system charged with the transfer of resources to the public sector. The third objective was to reduce tax-induced distortions in the allocation of resources. Lastly,the reforms were meant to ensure that the poor would not be made worse off, although the program was not designed to improve income distribution.

The main instrument for achieving the first objective was the VAT Package, with the expectation that the income tax and the land and building tax, together with improvements in tax administration, would significantly contribute to raising the NOTR/GDP ratio in the medium term.

To achieve the second objective, the new tax laws were designed to be simple and free of ambiguity. Definitions of taxable objects and subjects with quantified criteria were included in the laws, and the statutory bases were clearly identified. The legal bases for various taxes were defined quite broadly, and exemptions and exclusions were minimized. In contrast to the

old system, the new system introduced self-assessment by transfering to taxpayers the primary responsibility for filing a tax return, determining tax liability, and paying taxes. Enforcement is undertaken mostly through selective auditing and internal checking. Computerization of tax administration and extensive training schemes have been adopted.

The third objective was to be achieved by broadly defining the income tax base and eliminating all income-tax-based fiscal incentives. The VAT Package was expected to reduce input taxation. Consistency in tax administration was expected to lead to a reduction in tax-induced distortions. The fourth objective was to be achievedby keeping nominal rates low; eliminating exemptions enjoyed by high-income groups; and using exemption levels, especially for the income tax and the land and building tax, to keep the poor outside the tax net.

Patterns of Expenditures

To achieve economic development and maintain stable prices, budgetary policy was guided by the principle of a dynamic and balanced budget. In response to decreasing oil and gas revenues, the government took steps to increase domestic revenues, especially from the non-oil sector, by intensifying tax collection and expanding the base source of revenues. On the expenditure side, the government took steps toward tightening budgetary policy, while maintaining the ongoing development efforts initiated in the preceding years.

The first step was to rephase large capital- and import-intensive projects in May 1983. The objectives of this policy were to save foreign exchange reserves, avoid a budget deficit, and improve BOP. This policy continued major cutbacks in government real capital spending

and the tight control policy on the use of non-concessional import-related credit in place since 1984. In addition, the government did not adjust civilian services basic salaries between FY 1985/86 and FY 1988/89 to control routine expenditures. Moreover, the government took actions to restrain new investment in public enterprise.

Monetary and Financial Policies

In the period when Soekarno governed, the Indonesian banking system channeled new currency into the economy. In addition, a budget deficit resulted from maintaining the desired level of expenditure while government revenue declined. The central bank--Bank of Indonesia- used tight direct control in dealing with state banks. The economy was characterized by very high inflation rates, which peaked at 595 percent in 1965.

The New Order government set about rebuilding the banking system and opening up the economy. Two main objectives were to stop inflation through tight fiscal/monetary control and to create a banking system that could have an active role in supporting development. Because one goal was to improve the role of financial intermediaries, the central bank switched from a tight direct to an indirect monetary control policy. The removal of all foreign capital controls in 1971, after freely converting the rupiah starting in 1968, was a part of the reforms. Since then, Indonesia has adopted monetary and financial policies consistent with free capital mobility.

The indirect monetary control policy was challenged by the economic recovery effort in the late 1960s. The strong pressures, however, came from the huge inflow of oil foreign

exchange earnings in FY 1973/74. Under pressure from the large increase in reserves, the expansion of bank credit was excessive, even though the requirement for a liquid asset ratio was high at 30 percent. The pressure led the central bank to move from indirect to direct monetary control policy by implementing a new system incorporating a credit ceiling in April 1974. After this reform, the development of monetary and financial policies was dampened by the role of foreign exchange earnings from oil and LNG. The external shocks in the early 1980s from the world oil market and international recession brought about the reevaluation of the systems.

A series of monetary policy and financial restructuring began on June 1, 1983. The first reform was a continuation of earlier in exchange rate management and fiscal policy reforms. The following section discusses the reforms, with emphasis on monetary policy change, the money market, and capital market development.

Monetary Policy Change

Monetary policy in Indonesia can be classified into two financial regimes characterized by different monetary objectives and the use of different policy instruments. The first regime covered the period 1974-82. This regime of direct monetary control policy, which was dominated by the new credit ceiling and central bank intervention on credit allocation, was associated with the high economic growth period led by oil and LNG , and timber exports. Financial development, however, did not improve.

The second regime related to economic restructuring, for which the monetary reform started in June 1983. This regime was characterized by an indirect monetary control policy in which development of new monetary instruments based on market operation was introduced. This period was associated with a decline in oil and LNG foreign exchange earnings, a reorientation of production toward exports, and relatively high economic growth. In contrast to the first regime, the financial system under this regime was highly developed.

Monetary Policy Instruments Monetary instruments are subject to adjustment in pursuing monetary objectives when conditions within the economy change. To show the occurrence of structural change in the Indonesian economy, monetary instruments are reviewed next.

Credit Ceiling and Credit Policy. The credit ceiling was the dominant monetary policy instrument from 1974 until mid-1983. The instrument was introduced with the issuance of the central bank credit policy for state-owned commercial banks. Accompanying the credit ceiling, Bank of Indonesia allocated the maximum credit that could be extended to a particular economic sector to the state-owned commercial banks. For some economic sectors, Bank of Indonesia provided so-called liquidity credit, with interest subsidized for both state-owned and private commercial banks. The rationale for using the credit ceiling as a means of controlling money supply growth was related to the ineffectiveness of the high-level reserve requirement in controlling commercial bank lending expansion.

On June 1, 1983, the credit ceiling was removed as a monetary instrument policy. To prevent the expansionary effects of the removal of the credit ceiling, the central bank decided to reduce the liquidity credit. Sixty percent of the liquidity credit outstanding in March 1983 would not be allowed for renewal. Furthermore, the reform permitted state-owned commercial banks to determine their loan allocations.

Further policy reform that included changes in credit policy was introduced in January 1990. With respect to credit policy, the changes are as follows. Liquidity credit would be reduced and then phased out starting March 1, 1990. The use of the credit ceiling became more specific. The export credit that was introduced to encourage exports was lifted and phased out beginning April 1, 1990. This change was related to a GATT requirement. The reform also required all national banks to allocate a minimum of 20 percent of their loan portfolios to small business within one year. The policy replaced subsidized credit programs that were abolished through the reform itself. Furthermore, the reform required foreign banks to allocate 50 percent of their credit portfolios to finance export-oriented activities.

A new monetary control policy was also introduced. The central bank set legal lending limit rules for credit extended by commercial banks. The rules set the amount of credit extended by banks to affiliate companies, bank insiders, or single debtors at not more than 25 percent of total credits. The policy was intended to provide wide access for credit, prevent fund concentration, and ensure security by diversifying the source of the risks.

The Reserve Requirement By moving to a direct monetary control policy in 1974, reserve requirements became redundant for domestic credit purposes because credit ceilings effectively constrained bank lending. Then, in January 1978, the monetary authorities reduced the reserve requirement to 15 percent from the previous 30 percent. This policy was also implemented to compensate the bank for the loss of deposit interest. With open capital movement, the reserve requirement served merely as a control for funds placed abroad. To prevent capital outflow, the central bank offered to pay interest on excess reserves held up to an amount equal to the reserve requirement. The effectiveness of this policy was questioned, however, because the real interest rate in Indonesia at that time was negative.

A very liberal policy regarding this instrument was taken during the rebuilding of the banking system in December 1988. The monetary authority further reduced the reserve requirement to a unified ratio of 2 percent (from 15 percent) for demand deposits and to 5 percent for time and regular savings deposits. In addition, Bank of Indonesia imposed a 2 percent reserve requirement for non-bank financial institution (NBFI) liability. This policy was issued when the money market started to develop. In this respect, it seems that the monetary authorities did not rely on this instrument to control growth of money supply. The instrument was mostly used in the first five years of indirect monetary control policy, together with other monetary instruments such as open market operations.

Interest Rates In the period 1974-82, Indonesia adopted a dual interest rate structure. The system was adopted because the government did not allow state-owned

commercial banks to set interest rates for deposits or loans, whereas private commercial banks were not subjected to these regulations. Under normal conditions, the policies provide some advantages to private banks. However,with no deposit insurance, security considerations, and the low-level banking habit, the movement of private savings into private banks was prevented. During the period, the central bank adopted a policy to keep interest rates low. Bank of Indonesia engaged in policies such as direct interest rate subsidiesthrough liquidity credit. These policies were associated with the excessive foreign exchange earnings from oil and LNG exports in the early 1970s.

The oil boom in this period had a significant effect on money supply in the Indonesian economy. The increase in government revenues due to oil price increases improved the government's ability to borrow funds from abroad. This period could be called the period of easy money. Another effect of the huge foreign exchange earnings was the conversion of foreign-exchange-financed government expenditures, which increased money supply. Overall, circumstances did not encourage private fund mobilization through the banking system and instead led to private savings in the form of gold, land, and foreign exchange.

When the price of oil and other export commodities began to fall in the early 1980s, the monetary and financial sectors were unable to respond to support development and mobilize private funds. This situation forced the government to reform monetary and financial policies. As part of the financial reform package on June 1, 1983, the central bank lifted most interest rate controls on state-owned banks, which allowed state-owned commercial banks to choose their deposit and loan interest rates. The removal of the dual interest rate system

created an incentive for commercial banks to compete for public. The new environment was expected to generate savings in the form of the rupiah. Based on this interest rate liberalization, Binhadi and Meek (1992) have concluded that monetary policy was focused operationally on short-term domestic interest rates.

Discount Window Facilities Underthe Soekarno regime, the central bank had little need to use discount windows when commercial banks experienced temporary reserve shortages. Instead, Bank of Indonesia provided liquidity credit to counter this reserve problem. As Ahmad (1993) has argued, Bank of Indonesia transferred its function from lender of last resort to lender of first resort during the period 1974-82.

By February 1984, Bank of Indonesia introduced two new discount window facilities to deal with reserve shortages in its movement back to lender of last resort. The first facility provided credit for liquidity purposes, initially for a period of two weeks, for amounts up to 5 percent of each bank's deposits. The initial discount rate, set at 17.5 percent, was considered a penalty rate to discourage refinancing of maturing liquid credits; however, assistance could be renewed at a higher interest rate for a total of four weeks. The second window facility was created to encourage banks to make term loans. This facility provided a two-month initial term limit to defend against inadequate deposit growth and permitted extensions at higher rates for a maximum of four months. Access, however, was limited to 3 percent of a bank's deposits. Banks that borrowed funds at either window had to submit their promissory notes to Bank of Indonesia as evidence of indebtedness (Binhadi and Meek, 1992). The aims of this

policy were to encourage banks to increase their dependence on deposits and discourage their reliance on the central bank. In addition, exessive use of these facilities signalled bank failure or poor management.

Open Market Operation The absence of domestic government securities in Indonesia's economy and undeveloped money and capital markets caused ineffective use of open market operation. Use of this instrument dealt mostly with foreign exchange rate market interventions. For purposes of controlling money growth, open market operation played a relatively small role in the presence of the credit ceiling in the period 1974-82.

When the monetary authorities decided to move from direct to indirect monetary control policy in June 1983, they left no effective instrument for controlling the growth of the money supply, except by increasing the reserve requirement. Instead of using this alternative, the central bank improved the effectiveness of its operation by introducing new money market instruments such as central bank certificates, known as *Sertifikat Bank Indonesia* (SBI), in February 1984, and new money market security such as a bank-endorsed instrument known, as *Surat Berharga Pasar Uang* (SBPU), in February 1985. With more instruments, Bank of Indonesia could have a more active operation.

Effectiveness and Competition in the Banking System Commercial banks, especially state-owned banks, faced no competitive challenges as a result of highly direct monetary control policies in the period 1974-82. Moreover, they had no incentive to improve

even their operational efficiency. The only way to compete in the financial market was through interest rates. The system also created barriers to entry that isolated the urban, or formal credit market from the rural or informal credit market. Too few banks served too many consumers. The only financial intermediary servicing the more developed rural areas was the village unit of Bank Rakyat Indonesia, a state-owned commercial bank that specialized in small agricultural credit and support for government projects in rural areas. During this period, state-owned banks dominated credit markets, and private banks found themselves able to serve only a relatively small market of private borrowers, in part because state-owned enterprises were restricted from investing in private banks.

The economic problems that Indonesia faced demanded far more active and effective monetary policies. In response to this challenge, the government introduced a broad set of financial reforms on October 27, 1988. A main objective of these reforms was to promote competition within the banking system. The new regulations allowed new entry and expansion of bank activities and gave more banks autonomy in decision making. The reforms provided new opportunities for engaging in practically all aspects of financial activities. As new licensing for domestic banks was opened, foreign banks that had been operating in Indonesia were permitted to open branches in major provincial cities. The licensing requirements for new joint ventures between foreign and domestic banks were also relaxed.

The reforms removed most regulations that benefited state-owned commercial banks. For instance, state-owned enterprises were now allowed to place up to 50 percent of their

deposits with private national commercial banks. This new environment forced commercial banks to improve their operational efficiency and their ability to attract customers.

Central Bank Supervision The rapid expansion of banks, branches, and assets after the first monetary and financial policy reforms increased the importance of Bank of Indonesia's supervision as a means of ensuring the soundness of banks, especially in an economy with no deposit insurance. The quality of a bank's portfolio and the adequacy of its management became the concern of the monetary authorities. Part of this concern arose from the competitive attitudes within the banking system resulting from the removal of interest rate and credit control, combined with the new entry regulations.

In response to these new challenges, Bank of Indonesia introduced regulations on supervision on February 28, 1991. An important element of the reform was the new guidelines for capital adequacy linked to the Bank for International Settlement standards. With these guidelines, Bank of Indonesia mandated higher risk-adjusted capital requirements to be phased in during 1992 and 1993. First, banks were required to have capital equal to 5 percent of their risk-weighted assets by March 1992, increasing to 7 percent by March 1993. By the end of December 1993, banks had to fulfill an 8 percent capital adequacy requirement. Other important elements included: (1) new levels of mandatory provisioning based on asset quality; (2) new public reporting requirements; (3) a prohibition on lending for securities trading and limits on margin trading in the foreign exchange market; (4) limits on a bank's net open position on its swaps with Bank of Indonesia to 20 percent of equity; (5) tightening of lending

limits to include on- and off-balance sheet items; (6) minimum experience requirements for bank directors;and (7) a minimum soundness rating before opening new domestic or foreign branches.

Because the financial system had been restructured, the banking law enacted in 1967 could no longer accommodate bank development. In response, the government passed a new banking law in October 1992.

Money Market Development

There aresignificant differences in the Indonesian money market between the periods 1974-82 and 1983- to the present. In addition to the three money market instruments introduced in the first period, three new money market instruments were introduced in the second period. Not only do the number of money market components differ, so do the activities of the markets themselves. In the process of economic restructuring, two financial reforms had a significant influence on the Indonesian money market. The first reform was introduced in June 1983, followed by a second stage of policy changes in February 1984 and February 1985, when SBIs and SBPUs were created. These instruments were expected to be used by the central bank in open market operation to reduce or increase bank liability after removal of the credit ceiling.

The second reform was introduced in October 1988. Even though this reform was intended to liberalize banking operations, the money market was included with respect to

money market instruments and participants. To analyze the changes in the money market, the six money market instruments are reviewed in the following sections.

Negotiable Certificates of Deposit The first instrument in Indonesia's money market is the negotiable certificate of deposit (NCD), introduced in 1971. The NCD is issued in bearer form and is legally transferable to another party prior to maturity. Lack of a secondary market for NCDs, however, eliminated the possibility of transfer from party to party prior to maturity. The tight interest rate controls adopted by the central bank in the period 1974-82 gave NCDs an even less important role in the market.

The reform implemented on June 1, 1983, brought a new perspective to this market instrument. Interest liberalization measures encouraged competition among financial institutions licensed to issue NCDs. Before October 27, 1988, a limited number of private national commercial banks were authorized to issue NCDs, but NBFIs such as investment finance companies (IFCs) and development finance companies (DFCs) were not yet licensed. Eligibility to issue NCDs was part of the October 1988 reform, which liberalized the issuance of NCDs by eliminating the licensing requirement for all banks and for NBFIs as well. Furthermore, the reform empowered state and private savings banks and private development banks to issue NCDs. The new maturity for NCDs allowed in the reform ranged from thirty days to twenty-four months. The limit on the amount of NCDs issued by a bank that other banks could hold was removed. However, the new tax on interest received by depositors subjected interest on NCDs to a 15 percent withholding tax.

The Interbank Money Market One of the main functions of money markets is to provide a source of short-term funds to those needing quick liquidity. The interbank call loan market, started in April 1974, fulfilled this function. Excluding Bank of Indonesia, the four groups of banks in the banking system-- state-owned and private national commercial banks, foreign banks, and regional banks --participated in the interbank call loan market. As is the case for NCDs, there is no broker participation in this market. All interbank lending is negotiated directly by the parties involved and transacted through Jakarta Clearing House. Interest rates in the call loan market have been freely set by market forces and have generally been quite volatile. The only restriction in the market was the ceiling on interbank loans equivalent to 15 percent of a bank's non-bank liabilities.

the June 1983 reform affected the development of this market instrument. The elimination of most interest rate controls on state-owned commercial banks improved mobilization of funds in the economy. All banks competed to improve their deposit position to support their lending fund requirement. However, private depositors preferred to put their savings in state owned commercial banks, which were considered safer in the absence of deposit insurance. In contrast, borrowers preferred to borrow from private banks, which had quicker and simpler lending procedures. The imbalance between deposit mobilization and lending capability of both types of bank significantly influenced the market. State-owned banks became net lenders and private and foreign banks become net borrowers. The October 27, 1988, reform removed the interbank loan ceiling.

The Commercial Paper Market Commercial papers (CPs) in the Indonesian money market are NBFI papers. NBFIs here include DFCs and IFCs. DFCs are intended to assist various types of development processes, while IFCs perform similar activities to those of a merchant bank. The issuance of CP was established in 1976, and the CP market has been largely unregulated since it was established. The sequence of financial reform, however, has had indirect effects on the market. As a source of NBFI funds, the CP market decreased in importance when the government introduced SBPUs in February 1985 and allowed some NBFIs to accept deposits based on the October 1988 reform.

The Surat Berharga Bank Indonesia Market The first of the three money market instruments established in the period of the economic restructuring from 1983 to the present was the SBI market. It became operational in February 1984. The SBI, or Bank of Indonesia Certificate, is the central bank's debt paper. Some deficiencies in the market, however, still needed to be removed. There was no secondary market for SBIs. Moreover, SBIs could not be redeemed prior to maturity. These weaknesses were removed when the central bank appointed Firoconvest, an NBFI, as a market maker for SBIs in August 1985. Other improvements were accomplished through reforms. For instance, along with the reduction of the reserve requirement from 15 percent to 2 percent in October 1988, the central bank required all commercial banks to purchase a specific amount of 3- and 6-month SBIs at fixed

interest rates to offset 80 percent of the funds released. Before this policy, implemented in July 1987, the SBI operation system was changed from a trading system to an auction system.

The issuance of SBIs was based on several considerations. First, the lack of an active domestic asset to absorb excess liquidity in commercial banks led commercial banks to keep foreign exchange assets against the risk of a possible devaluation of the rupiah. The second was the need for instruments for open market operation. With this instrument, banks could now absorb excess reserves at their own initiative. The third consideration was to expand the money market toward the process of financial deepening. Overall, it could be argued that the absence of government domestic debt is one of major reasons for creating this instrument.

The Surat Berharga Pasar Uang Market After almost a year of issuing SBIs, Bank of Indonesia faced the need for a more flexible instrument for conducting open market operations to inject reserves into the banking system. Excessive capital outflow in September 1984 caused the money market to experience reserve drain shocks. This incident was considered an indication that SBIs did not work as an effective instrument for open market operation. In response, a new bank-endorsed instrument known as SBPU, which could be purchased to supply reserve, was introduced on February 1, 1985. Another consideration in creating the SBPU was to broaden the interbank money market and provide a better money market infrastructure.

As money market securities, SBPUs are CP, endorsed either by banks or by NBFIs, that are discountable at Bank of Indonesia. SBPUs could be one of the following: (1) a

promissory note issued by customers of eligible banks or NBFIs to finance a specific transaction; (2) a promissory note issued by eligible banks or NBFI to borrow in the interbank money market; (3) a draft or banker acceptance drawn by customers and accepted by eligible banks or NBFIs; or (4) a draft drawn by one business and accepted by a customer of a bank or NBFIs. Firoconvest was appointed to create a market for this instrument. Like the SBI system, the SBPU operation system was changed from a trading system to an auction system on July 23, 1987. One difference between the SBPU and the CP markets is that the SBPU market has been influenced by the central bank with respect to the amount of SBPUs held and rediscounted at Firoconvest. Other differences are that SBPUs are endorsed by a bank or NBFI, while CPs are not, and that CPs are not used for monetary control purposes, while SBPUs are used as an open market operation to influence bank reserve and are not subject to a reserve requirement.

The Repurchase Agreements Market The activity of the repurchase agreements (RPs) market in the Indonesian money market started in 1983. The nature of RP markets is similar to the market in the United States and in other East Asian countries. State-owned commercial banks rarely participate in this market. The main borrowers are DFCs, IFCs, private banks, and foreign banks. Bank of Indonesia participates in the market through its open market operation. The operation of this market has been affected by the introduction of SBIs and SBPUs; they both are additional instruments for RPs.

The RP market is not subject to heavy official regulation. The reserve requirement imposed on NBFIs in October 1988 had a significant effect on this market. Bank of Indonesia's monetary policy, whether pursuing a tight or easy money policy, influences the RP market.

Other Development Policy To support the development of the money market, the government regulations and reforms, included liberalization of private overseas borrowing. The objective of these policies was to bring money market activity from overseas foreign exchange markets to domestic rupiah money market activities.

Even though a free capital movement policy was sadopted in 1971, the government still imposed upper limits on overseas borrowing for private business. In March 1989, the government decided to lift the ceiling and replace it with a daily net open position limit of 25 percent of financial institution capital. This regulationmandated that the amount of total foreign exchange held can not be more than 25 percent of the financial institution's capital. The regulation was accompanied by a change in foreign exchange transactions, from same-day settlement to two-day settlement. Combined with the gradual adjustment in exchange rate between the rupiah and the US dollar, the reforms were expected to reduce short-term movement in and out of foreign exchange as a means of liquidity management by banks.

This liberalization of private overseas borrowing, however, opened the possibility of speculation in the money market, in part because of high interest rates in Indonesia. To limit

and direct overseas borrowing for productive investments, the government reimposed the ceiling on offshore borrowing for public enterprises, including state-owned commercial banks.

Capital Market Development

The effort to encourage the development of the capital market in Indonesia, located in Jakarta (the capital city), was started in the late 1970s when the government set up agencies called *Badan Pengembangan Pasar Modal* (Bapepam) to manage and regulate the stock exchange, and *Danareksa*, a government-owned corporation, to underwrite new issuances and offer investment units to the public. The primary objectives of this effort were to increase public participation in the capital market and to broaden Indonesian ownership of foreign joint ventures operating in Indonesia. Unfortunately, the capital market was inactive from 1980 through 1988.

The government took steps to activate the capital market with a package of measures in December 1987 as part of economic restructuring. This reform allowed foreign investors to participate in buying and selling of up to 49 percent of the capital issued in the capital market. Price controls on the exchange were lifted and regulations were introduced including licensing requirements for brokers, dealers, and others in capital market supporting professions. The regulations also included clearer procedures for the issuance of new stocks and authorized over-the-counter trade. Moreover, financial institutions were allowed to issue shares to the public.

The second set of regulations was introduced in December 1988. Besides setting important capital market provisions, private securities exchanges were allowed. The priority to underwrite 50 percent of all new issuances was removed from *Danareksa*, and joint-venture firms in newly authorized financial services were authorized to have up to 85 percent foreign participation. In November 1989, private securities companies were admitted to underwrite new issuaces.

Trade Policy and Investment Regulation

Dornbush (1990) has argued that two factors are needed to move from stabilization toward growth. First, the adjustment-induced pricing of resources has to be competitive by international standards. Second, incentives should be available to save and to keep savings at home. With these two factors in place, development will depend on building confidence in the domestic economy. One factor that can bring this confidence is a positive perception of the domestic production and investment climates.

Economic restructuring seems to have moved the Indonesian in the direction suggested by Dornbush. Trade policy reformsand deregulation in investment procedure, complemented by macroeconomic stability, have greatly contributed a major role in promoting broad-based growth and diversification in the economy. A series of trade reforms and deregulation measures were introduced to eliminate the high-cost economy and to enhance international competitiveness of domestic tradable goods. In addition, the investment deregulations were introduced to encourage both foreign and domestic investment by

providing new incentives and opening more sectors for new investment. Both major changes in trade and investment policies are reviewed in the following section.

Trade Policy Change

Indonesian trade policies have played a role in supporting both an inward- and outward-oriented economy. The first task for the Soeharto government upon taking power was to restructure the economy, moving away from an inward-looking economy. As Indonesia experienced plentiful supplies of foreign exchange earnings from oil and gas, some policies remained to protect domestic industries. Trade polices such as nontariff barriers (NTBs) and tariffs were used extensively for protection purposes. Raising government revenue was not a major objective.

The drastic decrease in foreign exchange earnings from oil and gas exports forced Indonesia to move away from its high dependence on oil and gas foreign exchange earnings for development purposes. To support an export-oriented economy, trade policy reforms were introduced. The government gradually moved toward using tariffs as the primary tool for protecting domestic industry. This move is the centerpiece of trade reform in Indonesia. Some changes were introduced to encourage non-oil and non-LNG export, and others were adopted to restrict exports of raw materials and to encourage domestic processing firms and protect natural resources.

Nontariff Barriers NTBs have had two purposes in Indonesian trade policy: to protect domestic industries and to reduce or discourage imports. NTBs that fulfilled the first purpose were adopted during the oil boom period, 1973-82. NTBs implmented for the latter purpose were introduced mostly at the end of the oil boom and continued to the period 1983-86. Most quantitative restrictions on imports in Indonesia were imposed through import bans, import licensing, explicit quotas, and deletion programs. Such policies, however, contributed to rising costs in the economy. As a result, Indonesia's tradable goods could not compete in the international market.

As part of Indonesia's economic restructuring, gradual removal of NTBs in favor of tariffs was introduced in a series of seven reforms implemented between October 25, 1986, and July 1992. On October 25, 1986, there were more than 1,700 tariff items under NTBs, covering 40 percent of total import value and about 68 percent of manufactured production. By July 1992, the government had removed 239 tariff items under NTBs and reduced the number of NTBs to 464 tariff items, covering about 13 percent of total import value and about 31 percent of manufactured production (GATT, 1991; Republik Indonesia, 1993).

The high costs within the economy were the main factor for removing NTBs. The policy had three beneficial effects on the pattern of incentives. First, the movement toward tariffs as a means of protecting domestic industry substantially increased the transparency of the trade regime. Second, by rectifying efficiency, the policy improved the terms of trade. Lastly, the policy encouraged domestic production of previously imported goods, especially input materials, to become more cost and quality conscious. On the other hand, the policy

was expected to support domestic export production by reducing import prices and delivery time, and improving the quality of input materials.

Tariff Changes With the relaxation of licensing restrictions, tariffs began playing a more important role in determining the level and pattern of imports. To open the economy, the government made some adjustments in tarification in a series of reforms between 1985 and 1992. Tables 2.1. and 2.2. summarize the tariff changes from 1985 to 1990.

In response to a GATT-sponsored initiative to convert all member countries to a standard system for classifying traded goods, a second important change in the tariff scheme was announced on January 1, 1989, in which Indonesia moved from the Customs Cooperative Council Nomenclacture (CCCN) classification system to the harmonized system. One objective of moving to this new system was to continue within the basic structure of the tariff schedule. With this change, the government took the opportunity to reduce the number of tariff positions with specific duties from 498 under the 1988 CCCN schedule to 19 under the 1989 harmonized system. Most of the specific duties were replaced with advalorem rates in the 50 percent to 60 percent range. However, the adverse consequence of this new system was increased useof import surcharges and split tariffs in the system.

Export Incentives The most important trade reform with regard to export incentives was the creation of a duty exemption and drawback facility in the May 6, 1986,

Table. 2.1. The Structure of Indonesian tariffs.

Tariff Rates	Total Tariff Items	
(percent)	1985 (CCCN)	1989 (HS)
0	278	714
5	1130	2094
10	571	753
15	235	406
20	607	893
30	785	1634
40	424	571
50	4207	581
60	150	1371
80		
100	17	86
200	2	29
Specific charge	521	19
Total	4927	9154

Source: GATT (1991).

Table. 2.2. The structure of import duty tariff for industrial products

Import Duty Tariff	Total Tariff Items	
(percent)	Before May 1990	After May 1990
0 - 10	2956	2908
15-20	1036	1116
25-30	1431	1706
35-40	447	1284
45-60	1505	88
>60	103	74
Total	7431	7176

Source: GATT (1991).

reform. To administer the scheme, the government created a new government body, known as *Pusat Pengelolaan Pembebasan dan Pengembalian Bea Masuk*, in the Ministry of Finance. The drawback facility was initially limited to firms that exported at least 85 percent of production. This restriction was eased by the December 1987 reform in which the export requirement was reduced to 65 percent of production. With this reform, the scheme was also expanded to incorporate foreign-aided public sector projects.

Another important policy component of export incentives was the condition of a pre-shipment export finance guarantee and export credit insurance. These measures were available to all firms involved in non-oil and non-LNG exports. With this policy, the government provided an interest rate subsidy to encourage exports. In line with the financial sector reforms and as a consequence of signing the GATT Code on Subsidies and Countervailing Duties in early 1985, the government was forced to remove its export certificate incentive scheme by April 1986.

Export Restrictions and Control In contrast to the removal of NTBs on imports, export restrictions and control have been expanded since the mid-1980s. The government extended export bans in 1988. As a consequence, export restrictions covered about 27 percent of total tradable goods by 1989, while export control covered about 75 percent of mining output including oil and gas, 18 percent of agricultural products, and 13 percent of manufacturing products excluding oil and gas. Overall, three-quarters of Indonesia's merchandise exports are regulated in some way (GATT, 1991).

Export restrictions in Indonesia have been implemented in the form of bans or prohibitions, licensing arrangements, quotas, and taxes. The restrictions have had significant effects on the structure of price incentives and the allocation of resources, particularly in natural-resources-based industries such as forestry. In addition to the export restrictions, Indonesia also applies export controls (e.g., export quality control in primary industry). Another policy regarding export restrictions affected by the reform was the export identification number. The December 1987 reform lifted this licensing requirement. Since then, the only legal identity needed to export is the possession of a trading license (SUIP) issued by the Ministry of Trade. Because the license is only available to domestic companies, however, other firms must have business licenses issued by the relevant government department.

Investment Deregulation

Investment regulations in Indonesia are based on two investment laws that reflect the classification of investment in Indonesia. The foreign investment law, enacted in January 1967, applies to all firms with less than 100 percent domestic equity, operating under the jurisdiction of the Capital Investment Coordinating Board (BKPM). The second law is the domestic investment law, enacted in November 1968. These laws offer a wide range of incentives for both foreign and domestic investors, mostly incentives are in the form of reduced or eliminated taxes such as duty exemptions on approved capital imports and raw materials.

In addition to these two laws, the government issued the Investment Priority List for the first time in February 1977. The list had a significant impact, especially on foreign investment. Another important step was the simplification and centralization of administrative procedures in October 1978 whereby BKPM offered "one-stop-service."

Indonesia has experienced two types of investment climate concerning both domestic and foreign investments. In the period 1974-82, government policy made fewer efforts to invite foreign investments, possibly because of the massive supply of foreign exchange earnings from oil exports. As Pangestu (1991) has indicated, four factors discouraged foreign investment to Indonesia during this period. First, ownership regulations required that foreign investment firms transfer a 51 percent equity share to domestic investors within ten years. Second, the "closed sectors" list was expanded, which reduced the number of sectors open to foreign investors. Third, the government reduced tax incentives such as the tax holiday policy. Lastly, regulation regarding the employment of expatriates became more restrictive.

The new era of investment regulation was introduced in response to the change in foreign exchange earnings from oil and gas. Indonesia moved to a more liberal approach. The first reform was introduced in 1985 and primarily concerned administrative procedure. The second reform, introduced in May 1986, brought about fundamental change from the foreign investment perspective. This reform included (1) treating foreign investment firms with 75 percent local participation (or 51 percent if a public company) like domestic investment firms with regard to access to state banks and domestic distribution rights; (2) making foreign investment firms that export at least 85 percent of their production eligible to invest in all

sectors; (3) allowing the equity requirement of 20 percent for the local partner to be paid in installments over the first five years (for high risks or high-technology projects, the local equity requirement could be reduced as low as 5 percent; (4) allowing reinvestment of the foreign investment firm's profits in their owned activities or in domestic investment firms as far as the sector is open to investment; (5) giving foreign investment companies that make additional investment an extension on their foreign investment licenses; and (6) reducing the minimum investment requirement of US $1 million for some activities such as consultancies (Hill, 1988).

The expectation was that foreign investment would contribute more to economic development, and new incentives announced on December 24, 1987, made Indonesia more attractive for foreign investment. Foreign investment companies with the majority of shares owned by Indonesians or with 20 percent of the company shares in the local stock exchange would be treated as domestic companies. For instance, they would have the same access to state-owned bank credit as domestic companies. Divestment rules were relaxed and time limits for domestic majority ownership were extended to 15 years, in some cases 20 years, compared with the previous 10-years limits. Jointventures in bonded zones would be permitted and could be continued with 95 percent foreign ownership for the lifetime of the project if the production was mostly for export purposes.

The Indonesia Economy Adjustment Progress and Structural Change

The following sections focus on Indonesian economic and policy performance. The first section reviews the performance of fiscal adjustment with an emphasis on the performance of tax reforms and the pattern of government expenditures. The second reviews the performance of monetary and financial policies. The third section reviews the performance of BOP and international trade policies. The overall purpose of the discussion is to show the structural changes in the Indonesian economy induced by policy changes.

Fiscal Policy Performance

The uncertainty of oil and gas foreign exchange revenues brought about some rethinking of the central government's budget policy. Fluctuations in oil and gas prices in the early 1980s forced the government to restructure fiscal policies. Major reforms in the tax system were implemented in 1984. On the expenditure side, a tight budget policy was implemented in 1983.

On the revenue side, the performance of fiscal policy measures was considered asuccess. The overall NOTR/GDP ratio improved. Table 2.3 presents measures of the performance of fiscal policies in generating government revenue from FY 1969/70 through FY 1990/91. These measures show that the structure of overall central government revenues changed in FY 1983/84. Even though oil and gas revenues were still dominant, they started to decline in FY 1983/84. Revenue share from oil and gas decreased from 57 percent in FY

1982/83 to 52 percent in FY 1983/84with respect to total government revenue and from 14 per cent in FY1982/83 to 12 per cent in FY 1983/84 with respect to GDP at current prices. NOTR relative to total government revenue was down in FY 1982/83, but has gradually improved since then. The NOTR/GDP ratio, however, declined in FY 1982/83, remained stable in FY 1983/84, and then increased in FY 1985/86. This trend shows the result of the tax reform started in 1984. Development receipts show an increasing trend starting in FY1982/83 and continue at that level for both total revenue and GDP. Maintaining the

Table 2.3. Components of central government revenue, 1969/70-1990/91.

Fiscal Year	OGR	NOTR	DR	OGR	NOTR	DR
	(% of Total Revenue)			(% of GDP at current prices)		
1969/70	19.66	53.15	27.19	2.42	6.55	3.35
1970/71	47.13	21.43	25.94	3.06	7.51	3.70
1971/72	24.97	44.72	24.05	3.83	7.82	3.69
1972/73	30.80	39.97	21.08	5.05	7.89	3.49
1973/74	32.62	41.06	17.40	5.66	8.67	3.02
1974/75	48.20	29.25	11.68	8.94	7.44	2.17
1975/76	45.66	27.28	17.98	9.87	7.86	3.89
1976/77	44.32	25.59	21.24	10.57	8.22	5.07
1977/78	45.23	27.86	17.95	10.24	8.34	4.06
1978/79	43.55	28.68	19.53	10.15	8.61	4.55
1979/80	52.73	22.75	17.10	13.30	7.61	4.31
1980/81	59.89	19.86	12.74	15.45	7.06	3.29
1981/82	61.97	18.71	12.28	15.97	6.64	3.16
1982/83	56.90	21.48	13.51	13.64	7.09	3.24
1983/84	51.98	20.19	21.20	12.26	6.32	5.00
1984/85	53.81	21.17	17.94	11.62	6.10	3.88
1985/86	48.82	26.91	15.65	11.51	8.37	3.69
1986/87	28.95	40.05	26.27	6.18	9.56	5.61
1987/88	37.27	35.52	22.84	8.07	8.64	4.94
1988/89	28.87	38.22	30.28	6.70	9.48	7.03
1989/90	29.48	41.07	24.70	6.72	10.44	5.63
1990/91	35.82	37.01	20.03	8.96	11.04	5.01

Note. OGR stands for Oil and Gas Government Revenue, and
DR stands for Development Receipts.
Source: Republik Indonesia.

momentum of development is a possible reason for increasing the role of development receipts. This implies that borrowing compensated for the decrease in the role of oil and gas revenues, which was necessary because the government was committed to keeping a "balanced" budget.

Table 2.4 provides greater detail on the performance of the tax system reform and the effect of trade policy reform on government revenues. Income tax revenue dominated other tax revenues until FY 1984/85, and even then it still had a major role in NOTR. The role of income tax was replaced by the VAT Package in FY 1985/86 as expected and designed. The land and building taxes declined in the first year of implementation of the law, but havegradually increased since then. Concerning the NOTR/GDP ratio and the previous discussion, the role of NOTR in the revenue structure has increased significantly and is expected to continue to increase. The figure on international trade taxes such as tariffs, import duties, and export taxes reflects Indonesia's import-export performance. The import tariff revenue started to decline in FY 1982/83 and fell drastically in FY 1985/86, before increasing and remaining level. The most dramatical change is shown by the export tax revenues started in FY 1982/83. Import duties began to decrease in FY 1985/86, whichcould be interpreted as an effect of the major trade policy reform started in May 1986. It is clear, then, that the turning point in the change in revenue structure occurred in FY 1983/84. The central shift in the structure of NOTR is the movement to the VAT Package as a dominant source of government revenue. This revenue-side shift was accompanied by a change in the expenditure pattern.

Table. 2.4 Components of non-oil tax renenues, 1969/70-1992/93. (percent of NOTR)

Fiscal Year	Income Tax /a	VAT /b	Tariff	Import Duties	Export Tax	Land and Building Tax /c	Others /d
1969/70	24.60	17.73	33.01	18.36	4.23	0.06	2.00
1970/71	22.15	17.62	30.66	16.45	11.10	0.04	1.99
1971/72	26.17	17.88	26.71	15.55	10.82	0.08	2.81
1972/73	27.17	19.14	22.49	14.53	10.05	4.73	2.06
1973/74	9.25	24.17	29.42	14.16	15.74	4.59	2.67
1974/75	30.94	21.07	22.00	10.19	9.63	3.90	2.26
1975/76	34.62	21.70	19.69	11.01	6.97	4.06	1.94
1976/77	33.15	22.96	22.34	11.34	5.35	3.84	1.02
1977/78	34.91	22.04	19.88	12.60	5.63	3.85	1.09
1978/79	34.95	19.63	16.72	14.32	9.41	3.85	1.12
1979/80	35.22	14.64	14.08	14.51	17.29	3.32	0.94
1980/81	38.46	15.93	15.49	15.14	10.55	3.18	1.24
1981/82	42.09	16.44	16.51	16.75	3.96	3.06	1.18
1982/83	44.76	18.56	13.69	16.27	2.16	2.95	1.61
1983/84	43.98	18.91	12.68	17.60	2.37	3.30	1.17
1984/85	40.30	18.34	11.07	18.22	1.90	3.77	2.40
1985/86	34.96	35.16	9.18	14.26	0.76	3.39	2.29
1986/87	29.70	37.93	12.56	13.81	1.03	2.49	2.49
1987/88	30.34	38.62	10.69	12.59	2.09	3.13	2.54
1988/89	33.16	37.83	10.01	11.67	1.31	3.56	2.45
1989/90	35.58	37.84	10.29	9.57	1.11	3.83	1.79
1990/91	34.26	37.84	12.61	9.72	0.22	4.11	1.23
1991/92	39.82	37.10	8.87	9.24	0.08	3.64	1.26
1992/93/e	37.89	38.24	10.54	8.46	0.21	3.43	1.23

/a. Until 1983/84 consists of income tax, corporate tax, and witholding tax
/b. Until 1984/85, consists of sales tax and sales tax on import.
/c. Until 1985/86, consists of iuran pembangunan daerah and property tax.
/d. Consists of stamp duties.
/e. Budget.

Source: Republik Indonesia.

The Indonesian government adopted a dynamic budget policy, while maintaining a balanced budget policy. On the expenditure side, the ratio of total expenditure to GDP has shown little change, even though a tight budget policy was implemented in May 1983 in response to the change in oil and gas revenues. A significant change, however, occurred in the government expenditure pattern, starting in FY 1983/84.

Table 2.5 shows that both non-debt routine and departmental development expenditures as a proportion of GDP have fallen since FY 1983/84, while debt routine and project development expenditures have risen significantly. The decline in departmental development expenditures reflected the tight budget policy. The change in non-debt

Table.2.5. Components of central government expenditure 1975/76-1992/93 (percent of GDP),

Fiscal	Routine Expenditure		Development Expenditure			
Year	Non Debt	Debt	Department	Regional	Project	Other
1975/76	9.92	0.62	3.05	1.85	3.73	2.43
1976/77	9.32	1.22	3.81	1.84	5.00	2.62
1977/78	10.09	1.20	3.91	1.92	3.88	1.62
1978/79	9.71	2.35	3.74	1.89	4.34	1.26
1979/80	10.55	2.14	4.62	1.71	4.11	2.18
1980/81	11.04	1.73	5.57	1.78	3.15	2.52
1981/82	11.19	1.72	5.04	2.10	3.08	2.62
1982/83	9.63	2.05	5.44	1.82	3.21	1.81
1983/84	8.12	2.71	4.15	1.86	4.98	1.76
1984/85	7.41	3.09	3.87	1.70	3.80	1.72
1985/86	8.91	3.43	4.61	1.55	3.62	1.45
1986/87	8.29	4.93	1.95	1.43	3.70	1.04
1987/88	7.45	6.59	1.11	1.07	4.36	1.07
1988/89	6.90	7.70	1.31	1.05	5.59	0.67
1989/90	7.40	7.13	1.50	1.03	5.03	0.71
1990/91	8.40	6.77	2.45	1.52	4.30	0.55
1991/92	7.39	5.91	2.63	1.74	3.89	1.32
1992/93	7.32	5.92	3.06	1.96	3.97	0.40

Source: Bank of Indonesia.

expenditures seems to compensate for the rise in debt routine expenditures. One factor that contributed to the rise in debt service expenditure and debt repayment was the March 1983 devaluation. In contrast to the declining expenditures, the project development expenditurecontinued to increase. Changes in spending patterns show the impact of reform on goverment personal expenditures. Basic salaries of government employees were frozen from FY 1985/86 to FY 1988/89. In addition, four economic sector projects--industry, mining and energy, transmigration and environmental--suffered a decline in budgetary allocations. Budget shares allocated to agriculture, irrigation, and education were not affected.

The effects of fiscal measures on the central government's budget deficits are summarized in Table 2.6. The table shows that the government succeeded in maintaining the balanced budget policy. The roles of foreign aid and borrowing continued to increase, despite the increase in government savings. The most significant increase occurred in FY 1983/84. These figures can be explained as follows. The Soeharto government continued to show a strong commitment to the balanced budget policy, both during the oil boom and in the much tighter fiscal climate. The decline in world oil prices in the 1980s led to a sharp decline in revenue accruing to the government from oil taxes. To compensate for the drastic decline in revenue, the government was forced to increase foreign borrowing and aid in order to keep a balanced budget. The key feature of the balanced budget policy is to manage any deficit or foreign loans at an acceptable level and to avoid printing money to finance the deficit. Foreign loans were intended to act as a supplement to government saving, not to be a major source of financing for development expenditures.

Table.2.6. Central Government Budget Summary, (Rp. million)

Fiscal Year	Domestic Revenue	Routine Expenditure	Government Saving	Development Expenditure	Foreign Aid	Balance
	a	b	c= a-b	d	e	f=c+e-d
1969/70	243.7	216.5	27.2	118.2	91.0	0.0
1970/71	344.6	288.2	56.4	169.6	120.4	7.2
1971/72	428.0	349.1	78.9	195.9	135.5	18.5
1972/73	590.6	438.1	152.5	298.2	157.8	12.1
1973/74	967.7	713.3	254.4	450.9	203.9	7.4
1974/75	1753.7	1016.1	737.6	961.8	232.0	7.8
1975/76	2241.9	1332.6	909.3	1397.7	491.6	3.2
1976/77	2906.0	1629.8	1276.2	2054.5	783.8	5.5
1977/78	3535.4	2148.9	1386.5	2156.8	773.4	3.1
1978/79	4266.1	2743.7	1522.4	2555.6	1035.5	2.3
1979/80	6696.8	4061.8	2635.0	4014.2	1381.1	1.9
1980/81	10227.0	5800.0	4427.0	5916.1	1493.8	4.7
1981/82	12212.6	6977.6	5235.0	6940.1	1709.0	3.9
1982/83	12418.3	6996.3	5422.0	7359.6	1940.0	2.4
1983/84	14432.7	8411.8	6020.9	9899.2	3882.4	4.1
1984/85	15905.5	9429.0	6476.5	9951.9	3478.0	2.6
1985/86	19252.8	11951.5	7301.3	10873.1	3572.6	0.8
1986/87	16140.6	13559.3	2581.3	8332.0	5752.2	1.5
1987/88	20803.3	17481.5	3321.8	9477.4	6158.0	2.4
1988/89	23004.3	20739	2265.3	12250.7	9990.7	5.3
1989/90	28739.8	24331.1	4408.7	13834.3	9429.3	3.7
1990/91	39546.4	29997.7	9548.7	19452	9904.6	1.3
1991/92	41584.8	30227.6	11357.2	21764.2	10409.0	2.1
1992/93 /a	46508.4	33196.6	13311.8	22912.0	9600.2	0.0

/a Budget
Source : Republik Indonesia

beginning of the Soeharto regime that were dampened by the oil boom in 1973-82. These reforms were considered a success in terms of mobilizing funds, stabilizing the economy, and improving efficiency within banking system. The result was a burst of growth in the economy.

Structural change occurred in the financial sector as a result of the reforms. Table 2.7 shows the trends in the monetary ratios from 969/70 through 1992/93. The structure of the

money supply changed in FY 1983/84. The composition of domestic liquidity (M2) significantly changed. Narrow money declined from 60 percent of M2 to 51 percent, while quasi money increased from 40 percent to 49 percent in the same period. Subsequently, the M1/GDP ratio stabilized and quasi money increased and dominated M1 in influencing M2. This can be seen from the growth of M1 and M2, which moved in different directions. The changes seem to result from the financial reforms that removed credit and state-owned commercial bank interest rate ceilings,and encouraged competition in the banking system.

The monetization of Indonesia's economy roughly doubled over the first twenty-three years of the first long-term (25-years) development program. This is indicated by the improvement of M1, which is used mostly as a means of payments. The M1/GDP ratio increased by about 200 percent during the period. On the other hand, the ratio of quasi money to GDP in the same period rose from 2.02 percent to 36 percent. The incremental increase in quasi money contributed to most of the growth in domestic liquidity. Quasi money consists of time and savings deposits that are primarily longer-term deposits. Its growth reflects the improvement in financial savings held in form of claims on the domestic banks. However, the growth does not explain the repatriation of claims held abroad.

High financial growth is expected when economic growth performance is high. The quasi money growth, however, does not show a strong relationship with economic growth in Indonesia. Cole and Slade (1992) have argued that the high financial growth Indonesia

Table: 2.7. Domestic Liquidity (%).

End of	Domestic Liquidity/b		Money Supply/c			Quasi Money	
Period /a	Total (% of GDP)	Change (%)	Outstanding (% of GDP)	% of Total	Change (%)	Outstanding (% of GDP)	% of Total
1969/70	9.79	67.80	7.77	79.30	61.10	2.02	20.70
1970/71	11.28	37.30	8.34	74.00	28.20	2.93	26.00
1971/72	14.92	50.10	9.80	65.70	33.30	5.12	34.30
1972/73	16.83	40.20	11.61	69.00	47.20	5.21	31.00
1973/74	17.81	56.20	11.61	65.20	47.90	6.20	34.80
1974/75	14.79	31.70	9.59	64.80	31.00	5.20	35.20
1975/76	17.89	36.20	9.89	63.20	39.00	5.76	36.80
1976/77	18.39	25.80	11.74	63.70	27.10	6.65	36.30
1977/78	17.21	15.10	11.09	64.50	16.30	6.12	35.50
1978/79	18.27	26.90	12.31	67.40	32.60	5.96	32.60
1979/80	18.12	39.60	11.86	65.40	35.60	6.26	34.60
1980/81	17.40	36.20	11.47	65.90	37.30	5.92	34.10
1981/82	18.79	28.40	12.54	66.70	29.90	6.25	33.30
1982/83	20.45	20.60	12.32	60.30	8.90	8.13	39.70
1983/84	20.29	28.70	10.37	51.20	9.20	9.92	48.90
1984/85	21.67	23.40	10.01	46.20	11.60	11.65	53.80
1985/86	24.95	24.30	10.82	43.30	16.50	14.14	56.70
1986/87	27.78	17.90	11.21	40.40	9.80	16.57	59.60
1987/88	28.63	25.20	10.14	35.40	9.80	18.50	64.60
1988/89	31.08	23.90	10.56	34.00	18.90	20.52	66.00
1989/90	38.43	45.70	13.23	34.40	47.60	25.20	65.60
1990/91	41.03	26.00	11.92	29.10	6.40	29.11	70.90
1991/92	44.38	24.20	12.03	27.10	15.90	32.35	72.90
1992/93	47.95	22.30	11.92	24.90	12.20	36.03	75.10

/a. Fiscal year ends March 31.

/b. Consists of M1 and Quasi Money, known as M2

/c. consists of Currency and Demand Deposit, known as M1.

/d. consists of Time and Demand Deposits as well as foreign currency deposits held by domestic private sector.

/e. included valuation adjustment of foreign currency deposits amounting to Rp.99 billion.

/f. included valuation adjustment of foreign currency deposits amounting to Rp.620 billion.

/g. included valuation adjustment of foreign currency deposits amounting to Rp.1447 billion

Source: Bank Indonesia and Central Bureau Statistics.

experienced during the oil boom was mainly a result of economic recovery from a long period of mismanagement and deterioration. Because the higher financial growth occurred when economic growth slowed down, they concluded that Indonesia's financial growth was more a result of financial policy measures than of overall economic growth. This implies that savings

Table.2.8. Factor Affecting Money Supply (Rp. billion).

End of Period/1	Net Foreign Assets	Central Government	Claims on Entities Enterprises and Individual	Quasi Money	Net Other Items	Money Supply Movement
1973/74	154	-25	470	-180	-165	254
1974/75	1	23	450	-138	-193	243
1975/76	-755	17	1273	-277	142	401
1976/77	445	-387	719	-195	-194	388
1977/78	590	-293	308	-135	-174	295
1978/79 /a	808	-291	1606	-191	-1243	689
1979/80	2578	-1180	809	-650	-560	997
1980/81	2292	-1820	1837	-687	205	1417
1981/82	-22	-164	2349	-684	-217	1561
1982/83 /b	229	486	3039	-1492	-1658	604
1983/84	3299	-2335	2636	-2836	-88	674
1984/85	2935	-3004	3465	-2755	292	933
1985/86	1071	1142	3834	-3234	-1326	1487
1986/87/c	2344	-1475	5568	-3298	-2114	1025
1987/88	2359	1820*	8200	-6043	-5210 *	1126
1988/89	-179	-120	11931	-6124	-3125	1707
1989/90	-712	-85	29667	-13054	-8670	7146

/1. Fiscal year ends on March 31.
/a. Included an increase from valuation adjustment of balances denominated in foreign exchange due to November 15,1978 rupiah devaluation.
/b. Included an increase from valuation adjustment of balances denominated in foreign exchange due to March 30, rupiah devaluation.
/c. Included an increase from valuation adjustment of balances denominated in foreign exchange due to September 12,1986, rupiah devaluation.
*. The significant change was due to the reconciliation of the foreign loan unused by the Government amounting to Rp. 1725 billion which was initially recorded at the Government sector, but since September 1987 transferred to net other items.
Source: Bank of Indonesia.

from rising incomes during the high economic growth period were presumably invested abroad.

The positive change in quasi money played a more significant role affecting money supply starting in FY 1983/84 (Table 2.8). Since then, however, claims on entities, enterprises, and individuals have become important expansionary components. The expansionary effect of this domestic sector dominated net foreign assets in the creation of money. This trend can be interpreted as a result of overall reforms in response to macroeconomic imbalances and attempts to spurt economic growth through an export-oriented economy.

Despite intensive monetary and financial reforms implemented since June 1983, the Indonesian banking system remains highly concentrated, although some progress has been achieved to correct this situation. Table 2.9 reflects the development of four groups of commercial banks in Indonesia for FY 1978/79 through FY 1989/90. On the basis of assets, the share held by private national commercial banks began to increase in FY 1982/83 and has continued to increase significantly since then. In contrast, the share of assets held by state-owned commercial banks and foreign banks decreased, and the share held by regional development banks remained unchanged.

The same pattern of change occurred for loan share in the banking system. Private national commercial banks showed an important development after FY 1983/84. Loan share

Table. 2.9. Total share of assets, loans, and funds by groups of Banks (percent).

End of Period /a	Group of Banks											
	State Owned Commercial Banks			Private Nationall Commercial Banks			Regional Development Banks			Foreign Banks		
	Asset	Loans	Funds	Asset	Loans	Funds	Asset	Loans	Funds	Asset	Loans	Funds
1978/79	78.7	81.4	75.7	9.3	8.7	10	3.3	1.9	4.3	8.7	8.0	10.0
1979/80	79.0	80.1	76.6	8.9	9.9	9.6	3.5	2.1	4.3	8.6	7.9	9.5
1980/81	79.8	78.9	77.8	9.4	10.7	9.6	3.9	2.8	4.6	6.9	7.6	8.0
1981/82	79.6	78.5	76.1	9.9	11.0	11.0	3.6	3.2	3.8	6.9	7.3	9.1
1982/83	77.0	78.4	70.7	11.2	11.9	13.2	3.2	3.2	3.5	8.6	6.5	12.6
1983/84	74.8	74.4	69.5	13.9	15.5	16.3	3.5	3.1	3.6	7.8	7.0	10.6
1984/85	73.4	73.9	66.6	15.3	17.5	18.5	3.5	2.9	3.9	7.8	5.7	11.0
1985/86	72.1	71.7	65.3	17.6	20.5	21.8	3.4	2.9	3.5	6.9	4.9	9.4
1986/87	71.3	71.7	66.0	19.5	21.0	22.8	3.0	2.9	2.9	6.2	4.4	8.3
1987/88	68.9	69.0	63.4	22.3	23.8	26.4	3.1	2.9	2.9	5.7	4.3	7.3
1988/89	69.0	70.5	63.7	23.1	23.0	27.3	2.9	2.5	2.9	5.0	4.0	6.1
1989/90	63.2	66.4	52.5	58.7	27.2	39.9	2.4	2.6	3.7	5.8	3.8	3.9

/a. Fiscal year ends March 31
Source: Bank of Indonesia

of regional development banks remained unchanged, while that of the other two groups decreased. With respect to fund mobilization, the share held by private national commercial banks increased significantly after FY 1983/84. The share held by the other three groups, however, decreased slightly. Despite significant improvement in the position of private national commercial banks, state-owned commercial banks still dominated the other three types of banks in terms of assets, loans, and funds. The performance of private national commercial banks signalled that thisgroup of banks adjusted quickly to the new environment with a more competitive attitude after the reforms. The state-owned commercial banks adjusted slowly. Their management style still operated in the bureaucratic mode, despite rapid accumulation of deposits as interest rates increased (Cole and Slade, 1992).

The number of banks and offices increased quickly after the October 1988 reform. Prior to this reform, financial regulations increased competition among banks to expand lending and attract deposits. Interest rates rose quickly after the March 1983 reform. The growth of total bank credit slowed. In contrast, credit development for the manufacturing and trade sectors moved in a positive direction. By the end of 1983, total bank credits for the manufacturing sector had increased by about 48 percent, excluding the effects of the rupiah devaluation of March 1983, and by about 54 percent if the devaluation is accounted for, compared to 27 percent in previous years. The same level of performance can be seen in the trade sectors. These results point to the success of the reforms and incentives introduced by the government to encourage non-oil and non-LNG exports, especially manufactured products.

As discussed, the absorption of credit by the economic sectors moved with positive growth but at a decreasing rate. This fact could have created a new problem in Indonesia's financial system because the slow absorption rate of credit could create excess liquidity. In the presence of high rates of saving, this position could force banks to take high-risk loans as the only alternative in an economy with no government bonds and an unattractive capital market. In this case, two considerations were faced by the authorities. The first was the need to create a non-inflationary monetary instrument for liquidity management purposes. The second was the problem of bank failure. The government responded to the latter concern by introducing regulations with the objective of strengthening bank supervision through the central banks, while the monetary authorities introduced SBIs and SBPUs to solve the first problem.

The development of the money market was significant. The valueof CDs issued by banks recorded a significant jump in June 1983 from Rp. 102 billion to Rp. 245 billion, even though this value decreased slightly after October 1985. The SBI market developed quickly. This change was significant, especially after the government required all banks to place 80 percent of their liquidity released from the decline in the reserve requirement from 15 percent to 2 percent into SBIs. The creation of a secondary market for SBIs and SBPUs made them more appropriate as monetary instruments,especially SBIs. The progress in transactions using SBIs as a monetary instrument is impressive. In FY 1985/86, two years after their introduction, SBI issuances in gross terms amounted to Rp. 6,186 billion, an increase of 202.4 percent compared to the previous year. SBIs outstanding at the end of March 1986 totalled

Table.2.10. Funds Raised Annully through New Issues of Bonds and Equity Shares in the Capital Market

	Issues (Rp.million)		
Year	Shares /a	Bonds	Total
1977-83	117205	94718	211923
1984	13951	60000	73951
1985	490	100000	100490
1986	769	150000	150769
1987	411	131000	131411
1988	57481	320000	377481
1989	3678217	671500	4349717
1990	11805117	385000	12190117

Source: Cole and Slade, 1992. Table. 3.5

Table. 2.11. Indicator of Stock Market Growth

	End December 1987	End December 1990
Market Composite Index		
Jakarta Stock Exchange	82	418
Number of Brokers/Dealers	39	211
Number of Security Companies	0	63
Number of Firms Listing		
Jakarta Exchange	24	126
Bursa Paralel	0	6
Number of Bonds Listed		
Jakarta Exchange	26	53
Bursa Paralel	0	3

Source: Cole and Slade ,1992. Table. 3.6

Rp. 1,394 billion, or an increase of 473.8 percent compared with those outstanding at the end of March 1985. The increase in SBI issuances can not be attributed only to the efficiency of banks in managing liquidity, but also to the increase in the frequency of issuances by the central bank and the creation of the secondary money market.

As mentioned, the capital market in Indonesia grew very slowly during the eight years after its reactivation for mobilizing long-term funds on August 1977. Response to the reforms introduced in December 1987 and December 1988 was outstanding. The number of business entities that offered stocks to the public jumped from 24 to 126 firms. Tables 2.10 and 2.11 summarize the trend in rising funds through new issuances of bonds and equity shares in the capital market annually from1977 to 1990.

Balance of Payment and International Trade

The BOP consists of two accounts that reflect each other-- the current account and the capital account--and either can be used to analyze BOP issues. However, the current account position is mostly used as a BOP measure in policy making. In that sense, the BOP target can be formulated as a target for the current account. In this section, both accounts will be analyzed.

The Current Account

Table 2.12 present the BOP for Indonesia for FY 1969/70 through FY 1992/93. Indonesia's current account measures of all imports and exports of goods and services generally fluctuated during this period. The first large current account deficit occurred in FY 1981/82 when the current account fell by almost 231 percent to a deficit of US $2790 million. The current account then declined by 152 percent in FY 1982/83. The decrease in exports

because of declining oil prices and the increase in imports and the services deficit caused this external imbalance.

The March 1983 devaluation and the fiscal policy that rephased government projects are among the most significant policy initiatives implemented to solve these problems. The March 1983 devaluation was intended to improve non-oil and non-LNG exports and to discourage imports at the same time, while the fiscal policy was aimed at reducing imports. Both policies were considered a success in reducing external pressure and improving the current account, which grew by 41 percent in FY 1983/84. The positive effects of the two policies were reflected in the current account until FY 1985/86. This success was also a result of the monetary and financial reforms that controlled inflation rates and the trade policy measures enacted in May 1985.

The second current account crisis occurred in FY 1986/87 as a consequence of the oil price shock. This shock caused a dramatic (44 percent) decrease in oil and LNG export value to US $6,966 million. This condition forced the rupiah devaluation in September 1986. The devaluation was also considered successful because its intended effect was felt for about five years.

A current account deficit reflects excessive imports of goods and services over exports in a particular period. Considering these three components of the current account, a structural break occurred on both the export and the import sides. This structural change resulted from policy reforms covering macroeconomic policies, trade policy, and the introduction of new private incentives.

Table. 2.12 . Indonesia Balance of Payement , 1974/75 -1992/93. (US.$. million)

	1974/75	1975/76	1976/77	1977/78	1878/79
A. Goods and Services					
1. Merchandise, Net	12265	12555	16386	18726	19796
Exports, f.o.b.	7168	7146	9213	10860	11353
Oil and LNG	5153	5273	6350	7353	7374
Non-oil and Non-LNG	2033	1873	2863	3507	3979
Imports,f.o.b	-5097	-5409	-7173	-7866	-8443
Oil and LNG	-1275	-930	-1753	-1490	-1711
Non-oil and Non-LNG	-3822	-4479	-5420	-6376	-6732
2. Services	-2227	-2591	-2842	-3684	-4065
Oil and LNG	-1240	-1205	-887	-1418	-1653
Non-oil and Non-LNG	-987	-1386	-1955	-2266	-2412
3. Current Account	-138	-854	-802	-690	-1155
Oil and LNG	2638	3138	3710	4445	4010
Non-oil and Non-LNG	-2776	-3992	-4512	-5135	-5165
B. S.D.Rs					64
C. Capital Account (Excluding Reserves)	440	843	1695	1521	1968
Official Inflows	660	1995	1823	2106	2208
Program Aid	180	74	147	157	94
Project Aid	480	1921	1676	1949	2114
Miscellaneous Capital, Net	-135	-1075	38	176	392
Official Debt Repayment	-89	-77	-166	-761	-632
D. Total (A.3 through C)	302	-11	893	831	877
E. Net Error and Omissions	-311	-353	108	-180	-169
F. Monetary Movements	9	364	-1001	-651	-708
G. Memorandum					
1. Exports/GDP	27.85	23.46	24.72	23.68	25.95
2. Imports/GDP	19.75	17.76	19.25	17.15	19.30
3. Openess	22.69	20.85	22.22	21.55	24.49

Source: Republik Indonesia and Central Bureau Statistics

Table 2.12. Continued

	1979/80	1980/81	1981/82	1982/83	1983/84
A. Goods and Services					
1. Merchandise, Net	29233	37127	40905	37168	36120
Exports, f.o.b.	18511	22885	22994	18672	19816
Oil and LNG	12340	17298	18824	14744	14449
Non-oil and Non-LNG	6171	5587	4170	3928	5367
Imports,f.o.b	-10722	-14242	-17911	-18496	-16304
Oil and LNG	-2672	-3681	-4916	-4365	-3489
Non-oil and Non-LNG	-8050	-10561	-12995	-14131	-12815
2. Services	-5591	-6512	-7873	-7215	-7663
Oil and LNG	-2693	-3016	-4147	-3213	-3589
Non-oil and Non-LNG	-2898	-3496	-3726	-4002	-4074
3. Current Account	2198	2131	-2790	-7039	-4151
Oil and LNG	6975	10601	9761	7166	7371
Non-oil and Non-LNG	-4777	-8470	-12551	14205	-11522
B. S.D.Rs	65	62			
C. Capital Account (excluding Reserves)	680	1708	3852	5880	5974
Official Inflows	2690	2684	3521	5011	5793
Program Aid	239	118	50	21	84
Project Aid	2451	2566	3471	4990	5709
Miscellaneous Capital, Net	-1318	-361	1140	1795	1191
Official Debt Repayment	-692	-615	-809	-926	-1010
D. Total (A.3 through C)	2943	3901	1062	-1159	1823
E. Net Error and Omissions	-1253	-1165	-2050	-2121	247
F. Monetary Movements	-1690	-2736	988	3280	-2070
G. Memorandum					
1. Exports/GDP	36.01	31.57	26.9	20.61	23.19
2. Imports/GDP	20.86	19.65	20.95	20.41	19.08
3. Openess	27.66	22.28	20.08	19.93	21.28

Table 2.12. Continued.

	1984/85	1985/86	1986/87	1987/88	1988/89
A. Goods and Services					
1. Merchandise, Net	34328	31164	25148	31295	34135
Exports, f.o.b.	19901	18612	13697	18343	19824
Oil and LNG	13994	12437	6966	8841	7640
Non-oil and Non-LNG	5907	6175	6731	9502	12184
Imports,f.o.b	-14427	-12552	-11451	-12952	-14311
Oil and LNG	-2797	-2474	-2095	-2355	-2072
Non-oil and Non-LNG	-11630	-10078	-9356	-10597	-12239
2. Services	-7442	-7892	-6297	-7098	-7372
Oil and LNG	-3381	-3480	-2287	-2726	-2508
Non-oil and Non-LNG	-4061	-4052	-2010	-4372	-4864
3. Current Account	-1968	-1832	-4051	-1707	-1859
Oil and LNG	7816	6483	2584	3760	3060
Non-oil and Non-LNG	-9784	-7955	-4635	-5467	-4919
B. S.D.Rs					
C. Capital Account (excluding Reserves)	2726	2360	4575	3235	2614
Official Inflows	3519	3432	5472	4575	6588
Program Aid	52	38	538	1296	882
Project Aid	3467	3394	4887	3279	5706
Miscellaneous Capital, Net	499	572	1232	1709	-211
Official Debt Repayment	-1292	-1644	-2129	-3049	-3763
D. Total (A.3 through C)	758	528	524	1528	755
E. Net Error and Omissions	-91	-498	-1262	57	-1432
F. Monetary Movements	-667	-30	738	-1585	677
G. Memorandum					
1. Exports/GDP	22.75	21.35	17.14	24.21	23.52
2. Imports/GDP	16.49	14.4	14.33	17.1	16.98
3. Openess	20.05	18.64	20.13	26.53	28.98

Table.2.12. Continued.

	1989/90	1990/91	1991/92	1992/93
A. Goods and Services				
1. Merchandise, Net	41204	51171	54517	60645
Exports, f.o.b.	23830	28143	29714	33395
Oil and LNG	9337	12763	10706	10420
Non-oil and Non-LNG	14493	15380	19008	22975
Imports,f.o.b	-17374	-23028	-24803	-27250
Oil and LNG	-2529	-3580	-3143	-2765
Non-oil and Non-LNG	-14845	-19448	-21660	-24485
2. Services	-8055	-8856	-9263	-9900
Oil and LNG	-2897	-3173	-3001	-3171
Non-oil and Non-LNG	-5158	-5683	-6262	-6729
3. Current Account	-1599	-3741	-4352	-3755
Oil and LNG	3911	6010	4562	4484
Non-oil and Non-LNG	-5510	-9751	-8914	-8239
B. S.D.Rs				
C. Capital Account (excluding Reserves)	2405	6780	5551	5308
Official Inflows	5516	5006	5600	4972
Program Aid	1037	718	127	175
Project Aid	4479	4288	5473	4797
Miscellaneous Capital, Net	575?	5856	4133	4992
Official Debt Repayment	-3686	-4082	-4182	-4656
D. Total (A.3 through C)	806	3039	1199	1553
E. Net Error and Omissions	-558	263	-218	-118
F. Monetary Movements	-248	-3302	-981	-1435
G. Memorandum				
1. Exports/GDP	25.18	26.23	25.51	26.36
2. Imports/GDP	18.36	21.46	21.29	21.51
3. Openess	31	32.46	34.91	37.46

Table 2.13 summarizes the performance of Indonesian exports from FY 1969/70 to FY 1991/92. The role of the two major components of Indonesia's exports--oil and LNG and non-oil and non-LNG-- started to change in FY1983/84. Non-oil and non-LNG exports rose at a rate of 37 percent and increased in share of total export value to 27 percent, up from 21 percent in previous year. In contrast, the growth of oil and LNG export value was negative 2 percent. This pattern changed in FY 1987/88, when the value of non-oil and non-LNGexports dominated over the value of oil and LNG exports. Based on these data, it can be stated that

Table. 2.13. Value and components of Indonesia Exports (US.$. million)

Fiscal Year	Oil and LNG	Non-oil and Non-LNG				
		Total	Agricultural	Manufactured/a	Mining	Other
1969/70	384	532	187	311	33	1
1970/71	443	722	303	362	56	1
1971/72	590	1177	406	321	450	1
1972/73	965	1049	576	414	56	2
1973/74	1708	1755	934	709	106	6
1974/75	5153	2080	1016	859	201	5
1975/76	5273	1815	849	841	122	3
1976/77	6350	2876	1358	1378	136	4
1977/78	7353	3792	2144	1480	153	15
1978/79	7374	3922	2022	1778	99	22
1979/80	12340	5883	3093	2602	153	36
1980/81	17298	5819	2624	2898	246	51
1981/82	18824	4282	1449	2577	205	51
1982/83	14744	3963	1291	2427	170	74
1983/84	14449	5410	1501	3430	171	308
1984/85	13994	5927	1502	4118	199	108
1985/86	12437	6051	1481	4355	200	15
1986/87	6966	6576	1702	4622	237	14
1987/88	8841	9414	1687	7438	280	8
1988/89	7640	12048	2035	9627	375	11
1989/90	9337	13870	1907	11430	531	2
1990/91	12763	15229	2181	12360	687	2
1991/92	10997	19165	2182	15945	1036	2

Source : Republik Indonesia

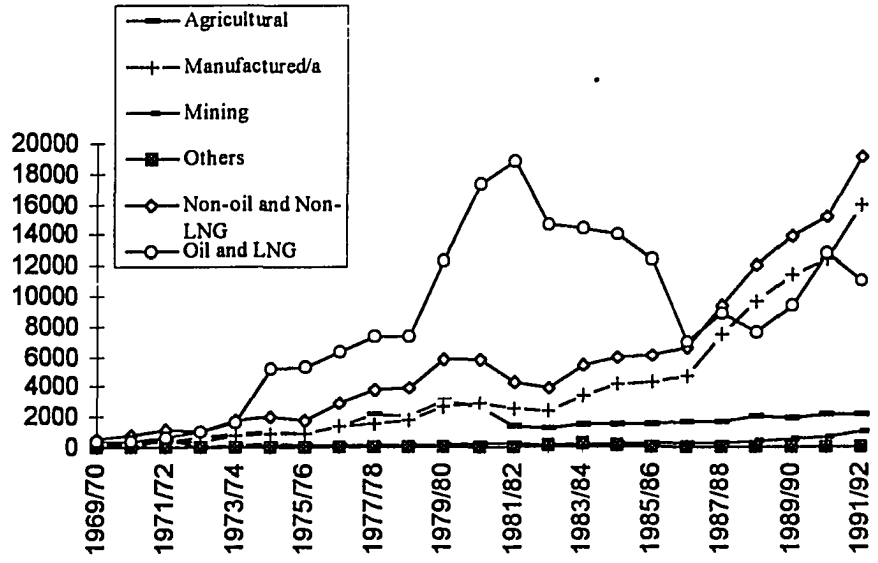

Figure 2.1. Value and Components of Indonesian exports (US $ million).

Indonesia became much less dependent on oil and LNG in its foreign export earnings in FY 1983/84. Figure 2.1 presents the performance of export value, by export component.

The way to improve non-oil and non-LNG exports is to promote export of manufactured products. In this respect, it is worthwhile to analyze the structure of non-oil and non-LNG exports. This component consists of agricultural commodities, manufactured products that are included as agricultural-based manufactured products, and mining products excluding oil and LNG. Table 2.14 presents the policy measures affecting the performance of these sectors. The export of manufactured products contributed to the improvement of non-oil and non-LNG exports, whereas the role of mining remained static and the role of agriculture decreased. It is noteworthy that growth in manufactured products was not stable,

growth in the agricultural sector tended to decline, and growth in the mining sector increased.

Moving from NTBs to tariffs as a way of protecting domestic production is the basic policy in trade reform. As shown Table 2.14, non-oil and non-LNG imports absorb mostlyforeign exchange earnings and continue to grow. Both the March 1983 reforms and the fiscal policy that rephased government projects contributed to a decrease in the value of imports for FY 1983/84 through FY 1986/87. The contractionary effect of the September1986 devaluation, however, is not clear from the total import value. It seems that

Table 2.14. Components of Non-Oil and Non-LNG Exports, 1969-91.

Fiscal Year	Agricultural (per cent)		Manufactured/a (per cent)		Mining (per cent)		Others (percent)	
	of total	change	of total	change	of total	change	of total	change
1969/70	35.15		58.51		6.19		0.15	
1970/71	41.92	61.96	50.19	16.49	7.74	69.91	0.15	37.50
1971/72	52.25	34.06	41.28	-11.53	6.37	-11.45	0.09	-36.36
1972/73	54.95	42.04	39.51	29.26	5.33	12.93	0.21	214.29
1973/74	53.20	62.01	40.40	71.14	6.05	89.98	0.35	177.27
1974/75	48.81	8.76	41.26	21.05	9.67	89.45	0.26	-11.48
1975/76	46.78	-16.40	46.32	-2.09	6.74	-39.21	0.15	-48.15
1976/77	47.22	59.95	47.91	63.91	4.73	11.20	0.15	50.00
1977/78	56.55	57.90	39.02	7.41	4.03	12.43	0.40	259.52
1978/79	51.57	-5.68	45.35	20.16	2.53	-35.19	0.55	42.38
1979/80	52.56	52.91	44.22	46.29	2.60	54.59	0.61	67.44
1980/81	45.09	-15.16	49.81	11.40	4.23	60.64	0.87	40.56
1981/82	33.83	-44.78	60.19	-11.07	4.79	-16.62	1.19	0.40
1982/83	32.58	-10.88	61.25	-5.82	4.30	-17.01	1.87	46.06
1983/84	27.75	16.29	63.40	41.30	3.15	0.12	5.69	314.96
1984/85	25.34	0.04	69.48	20.07	3.35	16.42	1.83	-64.79
1985/86	25.43	-1.40	71.97	5.74	3.31	0.81	0.25	-89.25
1986/87	25.89	14.96	70.29	6.15	3.61	18.59	0.21	-8.05
1987/88	17.92	-0.88	79.01	60.92	2.98	18.16	0.09	-40.15
1988/89	16.89	20.61	79.90	29.42	3.11	33.70	0.09	39.02
1989/90	13.75	-6.30	82.41	18.73	3.93	41.64	0.01	-85.96
1990/91	14.32	14.35	81.16	8.14	4.51	29.34	0.01	12.50
1991/92	11.39	0.09	83.20	29.00	5.41	50.89	0.01	-16.67

Source : Ministry of Finance.

the effects of the September 1986 devaluation generally complemented the government's export policy.Onthe other hand, the drawback policy taken before the devaluation reduced the effectiveness of this devaluation.

Table 2.15 summarizes the effects of the reforms on non-oil and non-LNG imports. It is clear from this table that the exchange rate management and fiscal policies were effective in curbing imports in order to improve the current account position. The significant effects of

Table 2.15. Total value and components of imports, 1969/70-1991/92.

Fiscal Year	Total	Consumer Goods		Basic Material and Auxiliaries		Capital Goods	
	(US$million)	(% of Total)	(% change)	(% of Total)	(% change)	(% of Total)	(% change)
1969/70	819.1	22.06		48.80		29.14	
1970/71	1006.3	17.70	-19.77	47.26	-3.15	35.04	47.72
1971/72	1189.9	13.19	-25.45	47.26	-0.01	39.55	33.47
1972/73	1808.6	16.24	23.08	43.70	-7.52	40.06	53.95
1973/74	2881.0	18.89	16.30	43.66	-0.09	37.45	48.93
1974/75	3905.4	16.87	-10.65	46.50	6.50	36.63	32.57
1975/76	4400.2	11.79	-30.10	48.89	5.13	39.32	20.95
1976/77	5441.2	15.28	29.51	39.63	-18.93	45.09	41.82
1977/78	5514.4	21.33	39.65	39.63	-0.01	39.04	-12.26
1978/79	6154.4	19.55	-8.38	42.51	7.27	37.95	8.48
1979/80	6891.3	17.03	-12.88	46.27	8.86	36.70	8.29
1980/81	9108.5	17.56	3.14	44.94	-2.88	37.50	35.05
1981/82	12000.3	14.19	-19.18	46.18	2.75	39.63	39.24
1982/83	13765.3	10.34	-27.17	44.45	-3.74	45.21	30.87
1983/84	11397.2	7.91	-23.53	47.75	7.43	44.34	-18.79
1984/85	10831.1	5.57	-29.52	53.09	11.17	41.34	-11.4
1985/86	8811.8	5.28	-5.25	55.90	5.30	38.82	-23.61
1986/87	10161.7	5.55	5.16	55.11	-1.41	39.33	16.85
1987/88	11559.6	4.85	-12.68	55.35	0.44	39.80	15.1
1988/89	13140.1	6.18	27.37	55.85	0.91	37.97	8.45
1989/90	15957.2	6.02	-2.52	55.47	-0.70	38.51	23.18
1990/91	21356.9	5.27	-12.46	49.83	-10.17	44.90	56.04
1991/92	23940.1	7.01	33.10	46.76	-6.15	46.23	15.39

Source: Republik Indonesia.

these policies were felt in the import of capital goods and consumption goods. The performances of all three import major components do not show significant change after the September 1986 devaluation. The structure of non-oil and non-LNG imports, however, changed beginning in FY 1983/84, when the share of consumer goods decreased to 8 percent and then stayed in the range of 5 percent to 7 percent thereafter. However, raw material and intermediate goods accounted for 47 percent to 56 percent of total import value until FY 1991/92. The improvements in the terms of trade caused by the March 1983 devaluation and shifting from NTBs to tariffs seem to have been effective in reducing the growth of import of consumer goods and basic materials and auxiliaries. The increase in capital goods imports could be a consequence of improvement in foreign and domestic investment as a result of new investment regulations that attracted both foreign and domestic investors. While the structure of the export and import sectors changed, the services sector of the current account did not reflect any effect of the reforms. This sector continued to grow and contribute more pressure to the current account position. Non-oil and non-LNG services grew steadily and even surpassed the role of both the oil and LNG imports and the services sectors because debt services is one of the components of this subsector. The sector is expected to continue to grow in the immediate future.

The Capital Account

The other side of BOP is the capital account. Indonesia's capital account excluding foreign reserves consists of official inflow, official debt repayment, and miscellaneous capital that consists of direct investment and government enterprises capital. Overall, the capital account improved steadily. The official inflows of program aid and project aid held a major share, while miscellaneous capital fluctuated and did not play a significant role until FY 1990/91. External pressure will continue to build up the current account and the capital account. Government and private external debt will become a major factor in the future. The influence of government external debt on BOP comes in two channels. For debt services, it will show up in the non-oil and non-LNG services sectors in the current account, and debt repayment will appear as official debt repayment in the capital account.

As part of the miscellaneous capital in the capital account, direct investment increased in importance. The new incentives and opening of new fields for direct investment introduced in 1985 provide good prospects. The significant growth of direct investment, started in FY 1987/88, has registed a 116 percent increase, to US $544 million. Japan and the United States have been major investors for a long time, and newly industrialized countries such as South Korea, Singapore, and Taiwan have begun to play significant roles in Indonesia's investment environment. Figure 2.2 shows the progress of government efforts to attract direct investment to Indonesia.

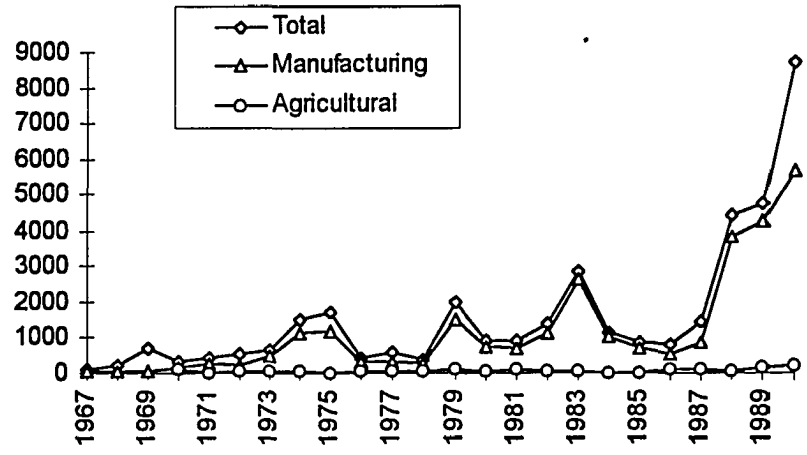

Figure 2.2. Value of direct investment approved (US $ million)

Economic Growth

One way to examine the economic growth in one country is through that country'seconomic performance as reflected in real economic growth presented in GDP. The growth rate of Indonesia's individual sector components of GDP reflect changes in their respective performances. Table 2.16 presents a summary of sectoral growth rates for the period 1973-90. The figures, however, consist of growth rates for the period 1973-83 counted at 1973 constant prices and for the period 1984-90 counted at 1983 constant prices. These figures are not directly comparable. Nevertheless, the trends of growth can be indicated. In the period 1984-90, there was a decline in the growth rate of all sectors, even though it was small in some sectors such as agriculture and significant in others such as mining.

Table 2.16 Sectoral Growth Rate, 1973-90 (percent)

Industrial Origin	Based on 1973 constant price	Based on 1983 constant price /a									Contribution to overall growth rate	
	1973-81	1982	1983	1984	1985	1986	1987	1988	1989	1990	1973-81	1984-90
Agriculture	3.49	2.11	2.81	4.15	4.22	2.55	2.22	5.35	3.69	2.77	1.23	0.78
Mining and Quarrying	3.59	-12.07	-2.98	6.29	-9.58	5.35	0.35	-2.89	5.82	4.28	0.37	0.21
Manufacturing	14.17	1.20	2.99	22.05	11.19	9.29	10.61	12.05	9.03	12.30	1.72	1.95
Utilities	14.07	17.78	22.64	3.22	11.39	19.09	15.54	10.53	12.15	17.88	0.08	0.06
Construction	12.97	5.42	3.69	-4.42	2.60	2.24	4.21	9.50	-36.52	14.24	0.66	0.30
Trade	7.38	5.68	3.20	2.19	5.05	8.57	6.75	9.05	9.95	8.31	1.29	1.08
Transport and Communication	13.77	5.91	14.37	8.42	0.99	4.04	5.76	5.55	11.51	9.99	0.6	0.35
Banking and Other	14.56	11.69	8.14	18.79	7.02	15.55	1.89	6.28	14.29	11.65	0.21	0.38
Dwelling	12.07	5.01	2.92	2.38	2.05	3.42	4.27	4.08	4.18	4.21	0.32	0.10
Public Administration	12.77	3.62	14.35	4.99	7.64	6.31	7.34	7.68	5.86	4.60	0.95	0.48
Other Services	2.39	1.57	7.74	3.87	2.03	3.72	3.74	4.90	5.60	5.01	0.08	0.15
GDP	7.51	2.24	4.58	6.74	2.47	5.95	4.76	6.02	7.54	7.37	7.51	5.84

/a. In 1989, The Indonesia government released a revised national account series for the period 1983-88.
Source: Central Bureau Statistics; Sundrum,1988.Table 4.

This study recognizes that an analysis of sectoral growth rates is not enough to explain overall trends in economic growth. A sector's contribution to overall growth depends not only on its growth rate but on its relative size as well. The rapid growth of any sector will not have much effect on the overall growth rate if that sector contributes only a small share to GDP. But even a low rate of growth will have a relatively greater effect if that sector is large. For this reason, it is useful to present the sectoral patterns of growth in terms of the contribution each sector makes to the overall growth rate. Table.2.16 indicates a change in the pattern of sectoral contribution to overall growth. The average sectoral contribution

Table. 2.17. Expenditure Components of GDP, 1973-1990 /a
(percent)

Fiscal Year	Private consumption expenditure	Government consumption expenditure	GDFCF	Export-import
1973	70.95	10.60	17.89	0.56
1974	75.03	8.82	19.81	-3.66
1975	74.42	10.96	21.62	-7.00
1976	73.96	11.00	21.44	-6.40
1977	72.52	11.77	22.86	-7.15
1978	72.71	12.95	24.60	-10.26
1979	77.38	13.23	23.96	-14.58
1980	79.40	13.34	25.93	-18.67
1981	85.86	13.61	26.70	-26.17
1982	86.80	14.41	29.51	-30.72
1983	89.56	13.70	30.53	-33.79
1984	67.70	11.55	25.31	-4.57
1985	66.97	12.18	26.57	-5.71
1986	64.56	11.81	27.37	-3.74
1987	64.61	11.42	27.97	-4.00
1988	54.24	9.93	25.21	10.63
1989	52.52	10.20	26.57	10.71
1990	53.75	9.82	28.73	7.70

/a. Series from 1973 to 1983 are based on 1973 constant price; all others are based on 1983 constant price.
Sources:Sundrum 1986,Table 4 and Table 5 for series 1973-83; Central Bureau Statistics

declined for the period 1984-90 compared to the average rate for 1973-81, following the decline in GDP growth. The average contribution of agriculture to overall growth declined from 1.23 percent in 1973-81 to 0.78 percent in 1984-90. The trade sector contribution was down 0.21 percent, while the mining contribution fell from 0.37 percent to 0.21 percent during the same period. In contrast, the manufacturing and banking sectors showed improvements in their contributions to overall growth. On average, these sectors improved their respective contributions from 1.72 percent in 1973-81 to 1.95 percent in 1984-90, and from 0.21 percent in 1973-81 to 0.31 percent in 1984-90.

Not only are the sectoral growth trends in both periods different, so are the sectoral patterns of the category's expenditure. All components of expenditure decreased, except for gross domestic fixed capital formation. Drastic change occurred for private consumption expenditure (PCE) and government consumption expenditure (GCE). PCE declined from 89.56 percent in 1983 to 67.70 percent in 1984 and ultimately to 53.75 percent in 1990. GCE declined from 13.70 percent in 1983 to 11.55 percent in 1984, and to 9.82 percent in 1990. In contrast, trade balance plus change in stock continued to increase their use of resources over time. The summary of expenditure components of GDP is presented in Table2.17

Summary and Conclusions

In the early 1980s, the Indonesian economy faced strong external pressure that led to an economic restructuring process starting in 1983. Three factors contributed to the shocks.

First, the decline in oil prices created a huge problem for the economy through its effects on export earnings and government revenues. Second, the worldwide recession in the early 1980s caused a decrease in demand for Indonesia's tradable goods. These two factors contributed to the deterioration of Indonesia's terms of trade. Lastly, depreciation of the US. dollar, especially against the Japanese yen, contributed to the rapid increase in Indonesia's external debt. All these factors caused a deterioration of the BOP with severe impacts on the current account position.

In restructuring the Indonesian economy, the government implemented a broad range of policy reforms to restore economic stability and sustain the momentum of development over the medium to longer term. The foundations of the reforms were exchange rate policy and monetary and financial policy reforms. With these reforms, the government expected to diversify sources of foreign exchange earnings and budgetary revenues, improve the economy's efficiency, and move toward an export-oriented economy. The main objective, however, was to achieve macroeconomic stability. The reforms were considered successful, but they brought about structural change in the Indonesian economy. The adjustment performance in fiscal, financial, and trade components and economic growth trends indicates that this change occurring in FY 1983/84. Because the exchange rate policy reform is one of the basic foundations of the overall reforms, it can be concluded that March 1983 was a turning point in Indonesian economic structural change.

In the immediate future, Indonesia will continue to face strong external pressure concerning its external debt position and the need for foreign exchange earnings and will need

additional efforts to achieve high economic growth. Exchange rate policy will play an even more important role than in the past. The position of the rupiah against major currencies such as the US dollar, Japanese yen, and German deutsche mark, and against others currencies such as the Korean won and ASEAN country currencies will have a significant impact on Indonesia's external debt position and macroeconomic imbalance. The other important role is related to international inflation transmission to the Indonesian economy. Therefore, it is important to study the Indonesian real exchange rate in the context of the optimum currency area argument, especially with Indonesia's managed floating exchange rate system.

CHAPTER 3. LITERATURE REVIEW

The Theory of Purchasing Power Parity

The three concepts of purchasing power parity (PPP) are usually used in explaining why goods in one country should cost the same as identical goods in another country. The law of one price explains the relationship of exchange rates with the prices of individual goods in different countries. Absolute PPP explains the relationship of exchange rates with overall price level, whereas relative PPP explains the relationship of exchange rates with inflation rates in different countries.

The law of one price states that the cost of identical goods should equalize in all countries, assuming the absence of trade restrictions and transportation costs. The concept of pure international trade states that autarkic price differences between countries exist because of technological or factor endowment differences, given that the regular conditions are satisfied. When trading in a perfectly competitive sense, the market forces the law of one price to be held. In reality, however, this is not as simple as it may sound. For example, the cost of transporting goods from one country to another limits the potential profit from buying and selling identical goods at different prices. In addition, tariffs and other trade restrictions drive a wedge between the prices of identical goods in different countries. Therefore, instead

of focusing on a particular good or service when applying the concept of PPP, it is necessary to extend the law of one price in terms of general price level.

The extension of the law of one price to general price level takes the form of the strong, or absolute, version of PPP such that:

$$EP^* = P \tag{3.1}$$

where E denotes the number of units of domestic currency per unit of foreign currencyand P^* and P are the foreign and domestic price, respectively. This extension requires that the domestic price index function has the same functional form as the foreign price index function and the same goods enter each country's market basket. The theory, therefore, assumes the existence of a price index. Let P_i be the price of the i^{th} good in domestic currency and P_i^* be the price of the i^{th} good in foreign currency; then, the two price indices can be defined as:

$$P = \prod_i^n P_i^{\alpha} \quad \text{and} \quad P^* = \prod_i^n P_i^{*\alpha_i^*} \tag{3.2}$$

where α_i and α_i^* represent system of weights with $\sum \alpha_i = \sum \alpha_i^* =$. These indices are justified using consumer theory by assuming that the consumer devotes a constant fraction α_i of his or her budget to the i^{th} good, which is given independently of relative prices. So the level of welfare or utility function between consumers depends on their purchasing power.

The PPP theory asserts that changes in the bilateral exchange rate over any period of time are determined by the changes in the two countries' relative prices. Because aggregate price level and exchange rate are both endogeneously and simultaneously determined, however, PPP can be viewed as an equilibrium relationship rather than as a theory of exchange rate determination. In addition, if the law of one price holds for all goods and if price levels in different countries are constructed in the same way, the absolute version of PPP should hold.

The absolute version of PPP can be accepted as a theoretical statement in a hypothetical economy. Objections arise when it is applied as an empirical proposition. Transportation costs and other obstacles to trade do exist, and hence the location of delivery matters. The prices of a given good will not necessarily be equal in different locations. These price differences do not indicate market failure. Market efficiency could be obtained, provided that the price system can incorporate all the costs of trade obstacles. Trade impediments do not suggest market inefficiency; however, restrictions on trade and imperfect competition make it possible for spatial price differentials to exist. Price levels in different countries are calculated using imperfect price indices, which are based in different years, include different market baskets of goods, and weight the various components of the market baskets differently.

Actually, a necessary condition for the absolute version of PPP to hold is the validity of the law of one price. Idsar (1977) studied the most disaggregated groupings of manufactured goods for which prices are available and found that for the period 1970-75, the

law of one price fails to hold. Even in commodities markets, where goods are more homogeneous than in industrial goods markets, the law of one price is not valid in the short run, though it tends to be so in the longer run. All these facts show the limitation of the strong, or absolute, version of PPP.

The weak, or relative, version of PPP states that it is no longer necessary for exchange rates to equal the ratio of price indices instantaneously; exchange rate can simply remain at a constant ratio. By incorporating transportation costs and other obstacles to trade in the concept of PPP, the relationship of exchange rates torelative prices between two countries can be written as:

$$E = \varphi \frac{P}{P^*} \tag{3.3}$$

where φ is any constant that represents the existence of the obstacle to trade or transportation cost. In terms of percentage change, the equation can be written as:

$$\hat{e} = \hat{p} - \hat{p}^* \tag{3.4}$$

where ^ denotes percentage change and e, p, and p^* are the log of E, P, and $P,^*$ respectively.

As a statement of the weak, or relative, version of PPP, equation (3.4) states that the percentage change in the exchange rate equals the percentage change in the relative price ratios between two countries. This relative version of PPP can also be interpreted as the rate of inflation differentials between two countries being balanced by corresponding changes in the exchange rate. The relative version of PPP, therefore, depends on the condition of the homogeneity postulate of monetary theory. The constancy of real variables under the assumption of money neutrality assures that once the economy has adjusted, the changes in exchange rate match inflation. Ballie and McMahon (1989) have argued, however, that the hypothesis of money neutrality is hard to accept in the short run because of institutional rigidities and imperfect dissemination of information.

Both the absolute and relative versions of PPP can be expressed in terms of the real exchange rate, r_t, as follows:

$$r_t = \frac{E_t P_t^*}{P_t} \tag{3.5a}$$

or

$$R_t = e_t - p_t + p_t^* \tag{3.5.b}$$

where R is the log of the real exchange rate.

This form defines the real exchange rate in terms of purchasing power between two consumption baskets. It can be seen from (3.5a) that the absolute version of PPP can be expressed as $r_t = 1$ for all t, while in the case of the relative version of PPP, the real exchange rate is constant over time, that is, $r_{t+1} = r_t = r$. In addition, it is clear that the change in the real exchange rate could come from the change in the nominal exchange rate or from the change in the inflation differential.

Purchasing Power Disparities

The doctrine of PPP may be expressed as the prediction that price levels should be equal across countries when compared by means of equilibrium exchange rate. However, there are several explanations and much evidence against this hypothesis. Ballasa (1964) showed that structural deviations from PPP are to be expected by emphasizing the importance of nonmonetary factors in the process of price determination. In the Ricardian framework, he argued that the currency of the higher productivity level countries will appear to be overvalued in terms of PPP because higher-income countries have higher relative productivity in producing traded goods. In addition, under the assumption of constant marginal rates of transportation, the relative price of nontraded goods will be higher in the country with higher productivity levels than in the country with lower productivity levels. By making use of the trade expenditure function, Neary (1988) supports the conclusion that structural deviations from PPP are to be expected because higher-income countries have higher relative

productivity in the production of traded goods. He states that if international productivity differences are smaller in the production of nontraded goods, the element of the difference between the two countries in average propensities to produce nontraded goods at constant prices is likely to be small or even negative. This concept implies that the higher-income country will have a higher real exchange rate. This effect will be reinforced, however, if nontraded goods are superior in demand because country-specific factors such as tastes vary relatively little over time.

Real factors can induce systematic deviations from PPP. Dornbusch, Fisher, and Samuelson (1977), in the context of the Ricardian framework with a continuum goods, found that shifts in labor force growth, real demand for foreign goods, commercial policies, and technology changes will all affect the movement of the real exchange rate under a flexible exchange regime. Each of these real shifts is assumed to take place given a nominal quantity of money in each country and constant expenditures of velocities within the context of the quantity theory of money. More precisely, they state that a uniform increase in traded goods productivity will raise the wages in that sector, which implies a national wage level increase. With no productivity gains in the nontraded goods sector, the price of nontraded goods will increase and then the relative price will increase.

In the case of an equilibrium model of exchange rate determination, Stulz (1987) has shown that the existence of nontraded goods makes it possible to explicitly address issues with regard to the determination of the real exchange rate. He found that real exchange rate levels follow the Martingale process when the means and variances of growth rates of stocks of

nontraded goods are constant and identical across countries. The variance of the real exchange rate can be larger than the variance of the nominal exchange rate in the presence of significant output shocks in the production of nontraded goods. In addition, the changes in real exchange rates are shown to be positively correlated to the changes in nominal exchange rates.

Another way of explaining departures from PPP besides structural deviation are by considering transitory deviations from PPP. Transitory deviations from PPP are usually the result of the differential speed adjustment of prices in assets and goods markets. This deviation is relatively persistent and often large. Such deviations could arise from divergent speeds in the adjustment of exchange rates compared with wage and price adjustments when there is a shock to the economy. In this case, the exchange rate is viewed as an asset price and wages are determined in long-term contracts. If a shock to the economy exists (e.g., a monetary shock), the asset market adjusts relatively faster than the goods market. This argument is used by Dornbusch (1976) in explaining the phenomenon of exchange rate overshooting. He has shown that an increase in money supply initially causes real and nominal exchange rate depreciation. Over time, the real rate converges to its original level and the proportional change in the nominal rate approaches the percentage change in the money supply. This means that the real exchange rate deviates from its long-run equilibrium in the short run as a result of a monetary shock.

The validity of the relative stickiness of price can depend upon the presence of goods market imperfection and the existence of long-term labor contracts. Imperfect competition in

the goods market is important because it eliminates the validity of the law of one price and the other arbitrages. In addition, the way a firm makes a decision in setting relative price matters makes a difference.

Related to these issues, Dornbusch (1985) has suggested that the extent of price adjustment depends on market structure, product substitutability, and the level of market integration. In the context of an imperfect competitive market with linear technology and labor as the only input, he argued that the independent relationship between the real exchange rate and the exchange rate relies on the relative number of home and foreign firms in the market and the rigidity of wages in response to changes in output and profitability, regardless of the neutrality of money in the economy. Because these condition are plausible in the short run, the relative national price rate deviates from its long-run levels in the short run. In the case of a monopolistic market structure with linear technology and labor as the only input, firms can set prices as fixed and common mark-ups over wages. Hence, the real exchange rate can be expressed in terms of relative national wage rates. Assuming wages are rigid, flexible exchange rate movement can cause the real exchange rate to deviate from its long-run level in the short run.

Moreover, Dornbusch (1989) argued that in the Ricardian framework for an industrial country, an improvement in a country's relative efficiency leads to real exchange rate appreciation. Gain in productivity reduces unit labor costs at the competitive margin and thereby leads to an incipient expansion in output and employment. Excess demands for labor at home (and the excess supply abroad) bring about a change in the relative wage and hence in

the competitive margin. The real exchange rate appreciates because wages in the home country rise in the domestic goods sector and fall in the foreign country. The wage increase raises the costs and prices of nontraded goods in the home country while lowering them abroad where there was no progress. Another source of real appreciation is a transfer received by the home country, which can be considered as borrowing from abroad. The mechanism works as follows. The transfer increases real aggregate demand in the home country. Part of the increased spending goes to traded goods and is offset by reduced foreign spending. This leads to excess demand for home goods and labor, which raises the relative wage and hence the relative price level in the country receiving the transfer.

The existence of nontraded goods provides a reason for rejecting the validity of absolute PPP. In this light, an illustrative model and the role of the relative price of nontraded goods on internal and external equilibrium will be discussed to show the role of nontraded goods in formulating and determining PPP.

An Illustrative Model

Consider a small open economy with two goods: nontraded and traded. In this economy, domestic price level is defined as a weighted average price of traded and nontraded goods such that:

$$p_t = \gamma p_t^T + (1-\gamma) p_t^N \tag{3.6a}$$

and

$$p_t = p_t^T + (1-\gamma)\rho_t \tag{3.6b}$$

where p^T and p^N are the log of the price of the nontraded and traded goods, respectively; and $\rho_t \left(= p_t^N - p_t^T\right)$ is the relative price of the nontraded goods. A corresponding expression holds for the prices in the foreign country.

Assuming that commodity arbitrage is held only in traded goods, PPP can be stated as:

$$p_t^T = p_t^{T^*} + e_t \tag{3.7}$$

where e_t is the level of the domestic currency price of the foreign currency.

Combining (3.6a) and (3.6b) into (3.7) and letting $\gamma = \gamma^*$ results in a relationship such that:

$$e_t = p_t - p_t^* - (1-\gamma)\left(\rho_t - \rho_t^*\right) \tag{3.8a}$$

and

$$R_t = -(1-\gamma)\left(\rho_t - \rho_t^*\right) \tag{3.8b}$$

These equations state that absolute PPP will hold as long as the relative price of the nontraded goods is the same in both countries. Because this relative price generally is not equal, it can be said that absolute PPP is mostly not valid. However, the relative version of PPP will hold as long as the relative prices of the nontraded goods in both countries does not change. This

implies that a shock in the relative priceof the nontraded good can cause a departure from PPP. In a more specific way, it can be stated that if $(\rho_t - \rho_t^*)$ is nonstationary, the real exchange rate will also be nonstationary, so that PPP will fail as a long-run relationship.

To understand the behavior of the relative price of the nontraded good, consider a dependent economy situation as depicted in Figures 3.1 and 3.2. In both figures, *PQ* is the production possibility curve of traded and nontraded goods. Therefore, point *A* represents the most profitable combination for producing both types of goods at their relative prices. The line *TU* is total expenditure. The slope of this line is also determined by the relative price of traded and nontraded goods. The maximum amount of traded and nontraded goods that can be purchased which this level of expenditure is *OT* and *OU*. In Figure 3.1, the line *RS* represents a revenue line in which the level of expenditure equals the full employment production function, given home and world prices. The slope of *RS* is determined by the relative price of traded and nontraded goods. The indifference curve *I* represents consumer preferences between traded and nontraded goods. Point *B* indicates how much traded and nontraded goods will be demanded, given expenditure *TU* and their relative prices.

As depicted in Figure 3.1, the economy is in a situation of external disequilibrium. Consumption takes places at point *B*. The market for the nontraded goods clears because demand and supply of nontraded goods are equal. Excess demand for traded goods can be fulfilled by importing $AB = RT$ units of traded goods. Consequently, the economy experiences a BOP deficit.

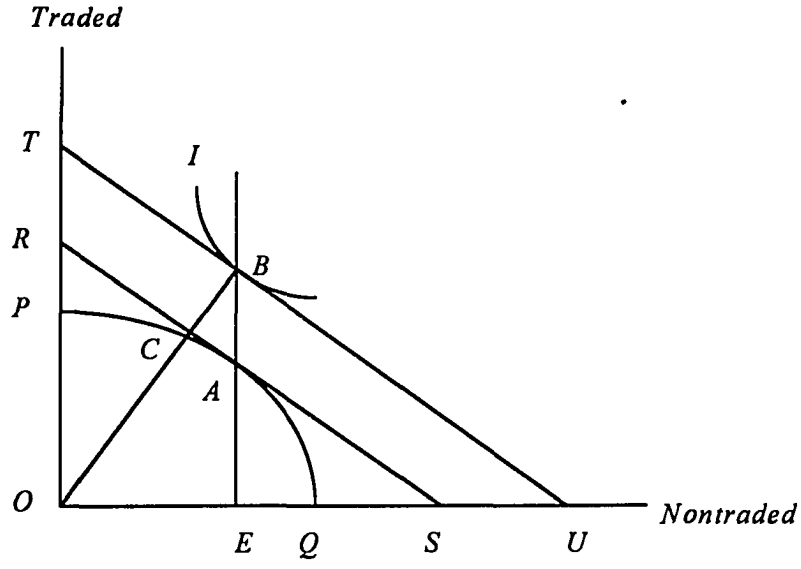

Figure 3.1. The disequilibrium economic condition in a dependent economy.

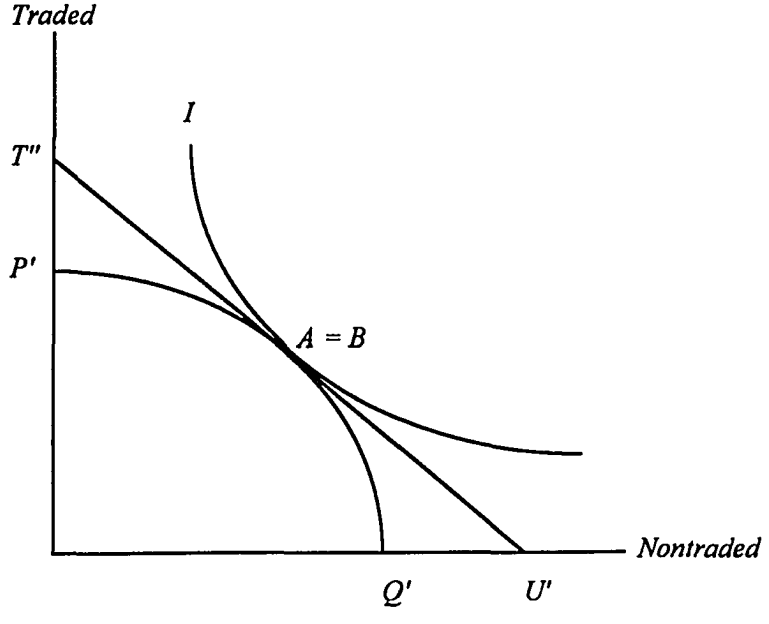

Figure 3.2. The equilibrium economic condition in a dependent economy.

The trade deficit is temporary in nature. The economy will always adjust until both internal and external equilibrium are reached (i.e.,long-run equilibrium requires that net imports equal zero). The dynamic adjustment of the economy is such that the wealth reduction associated with the trade deficit leads to a reduction in expenditure levels. In addition, the external excess demand raises price which causes the price of traded goods to rise relative to the price of nontraded goods. Let the initial expenditure-consumption line be given by line OB. Long-run equilibrium must occur on the production possibility curve (PQ) somewhere along line segment AC.

Figure 3.2 represents the equilibrium condition. The economy reaches its long-run equilibrium point when A and B have the same position in which the equilibrium relative price of nontraded goods is reflected by the slope of line $T'U'$. At this point, the economy is in equilibrium under the following conditions: (1) full employment income equals total expenditure; (2) the demand and supply of nontraded goods are equal (i.e., internal balance); (3) demand and supply of traded goods are equal (i.e., external balance); and (4) the marginal rate of consumer substitution equals the marginal rate of product transformation.

The equilibrium relative price of nontraded goods, which is constant and does not change over time, is rare and an extraordinary coincidence (Salter, 1953 ; Edwards, 1989) Changes in demand, the world price, and overseas capital inflow can cause internal and external equilibrium. In addition, as can be inferred from Figure 3.1 and 3.2, a rise in the relative productivity of traded goods, which is long-run in nature, will be associated with a relatively high price of nontraded goods. Given equationds (3.8a) and (3.8b), an increase in

the domestic relative price of nontraded goods will cause an appreciation of domestic currency in terms of the nominal and real exchange rates, respectively.

From the discussion above, it is clear that when there are changes in any of the other variables that affect the country's external and internal equilibrium, there will be changes in the equilibrium real exchange rate as a result of economic adjustment. The equilibrium real exchange rate will not only be affected by current fundamentals, but also by expected future evolution of the fundamentals. These results lead us to the question of the effects of a shock these in fundamentals on PPP in the short run as well as in the long run.

The Effects of Nominal and Real Shocks on Purchasing Power Parity

Many studies have discussed this issue. Edwards (1988), for examples, examined the case of a small open economy. He found that nominal shocks do not affect the long-run relationship of real exchange rates, but that real shocks do. In the present study, the two-country model of Dornbusch (1976) was chosen to explain the effects of nominal and real shocks on the long-run relationship of real exchange rates.

Consider the two-country version of Dornbusch's overshooting model. For simplicity, assume that the domestic and foreign countries have identical structural economic parameters. The economy, then, can be presented as shown in the following model:

$$\left(m_t - m_t^*\right) - \left(p_t - p_t^*\right) = \eta\left(y_t - y_t^*\right) - \lambda\left(i_t - i_t^*\right) \qquad (3.9)$$

$$(i_t - i_t^*) = \gamma(\bar{e} - e_t) \tag{3.10}$$

$$(D_t - D_t^*) = \delta(e_t - p_t + p_t^*) + \varphi(y_t - y_t^*) - \tau(i_t - i_t^*) \tag{3.11}$$

$$(p_{t+1} - p_{t+1}^*) - (p_t - p_t^*) = \pi((D_t - D_t^*) - (y_t - y_t^*)) \tag{3.12}$$

where D, e, m, p ,and y are the natural logarithms of excess demand, nominal exchange rate, money stock, price, and real income, respectively; t and $t+1$ are time subscripts; and asterisk and bars on top of variables denote foreign and long-run variables. All parameters in the model--η, λ, γ, δ, φ, τ, π--are positive.

Equation (3.9) is the relative real money equilibrium condition. This equation states that relative money supply is equal to relative money demand which is positively related to relative real income and an inversely related to the world interest differential. η and λ are the relative real income and interest elasticities of money demand, respectively. The relationship of the interest differential to the expected rate of currency appreciation is represented by (3.10). This relationship states that the interest differential is positively related to the expected rate of currency appreciation, but negatively related to the nominal exchange rate. As stated in the relationship of relative aggregate demand for goods, (3.11), relative aggregate demand varies positively with the real exchange rate and real income, but negatively with the

interest differential. Finally, (3.12) states that the relative inflation differential is positively related to relative excess demand and inversely related to the relative real income.

We now consider the effect of nominal and real shocks on the economy in the short-run. By inserting equation (3.10) into (3.9) and solving for the effects of domestic money supply and relative money supply on the relative price, we obtain:

$$\frac{\partial(p_t - p_t^*)}{\partial m_t} = \frac{\partial(p_t - p_t^*)}{\partial(m_t - m_t^*)} = 1 \tag{3.13}$$

We can also find the effect of an increase in real income on both nominal exchange rate and relative price, as follows:

$$\frac{\partial e_t}{\partial y_t} = \frac{\partial e_t}{\partial(y_t - y_t^*)} = -\frac{\eta}{\lambda\gamma} - \eta \tag{3.14a}$$

and

$$\frac{\partial(p_t - p_t^*)}{\partial y_t} = \frac{\partial(p_t - p_t^*)}{\partial(y_t - y_t^*)} = -\eta \tag{3.14b}$$

In the long run, $e_t = \bar{e}$, $(p_{t+1} - p_{t+1}^*) = (p_t - p_t^*) = (\bar{p} - \bar{p}^*)$, then by inserting (3.10) into (3.9), we get the long run equilibrium relative price level $(\bar{p} - \bar{p}^*)$:

$$(\bar{p}-\bar{p}^{*})=(m_t-m_t^{*})-\eta(y_t-y_t^{*}) \tag{3.15}$$

Taking the derivative of the relative price in (3.15) with respect to money supply and real income, the effect of rising domestic money supply and relative money supply is unity, while the effects of rising domestic real income and relative real income are a negative constant. Formally,

$$\frac{\partial(\bar{p}-\bar{p}^{*})}{\partial m_t}=\frac{\partial(\bar{p}-\bar{p}^{*})}{\partial(m_t-m_t^{*})}=1 \tag{3.16a}$$

and

$$\frac{\partial(\bar{p}-\bar{p}^{*})}{\partial y_t}=\frac{\partial(\bar{p}-\bar{p}^{*})}{\partial(y_t-y_t^{*})}=-\eta \tag{3.16b}$$

Having the relationship of (3.9), (3.11), (3.12), and (3.15) and applying the condition for long-run equilibrium, the system is solved with respect to the long-run equilibrium (nominal) exchange rate as:

$$\bar{e}=(\bar{p}-\bar{p}^{*})+\left(\frac{1-\varphi}{\delta}\right)(y_t-y_t^{*}) \tag{3.17}$$

Plugging (3.15) into (3.17), the effect of an increase in domestic and relative money supply on the long-run exchange rate is found to be unity, while the effect of an increase in domestic and relative income is ambiguous. Formally, they can be presented as:

$$\frac{\partial \bar{e}}{\partial m_t} = \frac{\partial \bar{e}}{\partial (m_t - m_t^*)} = 1 \tag{3.18a}$$

and

$$\frac{\partial \bar{e}}{\partial y_t} = \frac{\partial \bar{e}}{\partial (y_t - y_t^*)} = \left(\frac{1-\varphi}{\delta}\right) - \eta \tag{3.18b}$$

Given equation (3.18a), (3.9) and (3.10), the effects of change in domestic money supply and relative money supply on nominal exchange rate in the short-run can be presented as:

$$\frac{\partial e_t}{\partial m_t} = \frac{\partial e_t}{\partial (m_t - m_t^*)} = 1 + \frac{1}{\lambda\gamma} \tag{3.19}$$

Recall the expression of PPP in terms of the real exchange rate in a previous section, such that:

$$R_t = e_t - p_t + p_t^* \tag{3.5a}$$

Considering all the relationships in the system, this real exchange rate can be written in implicit function as:

$$R = R(e,\ m,\ p,\ y,\ \ldots) \tag{3.20}$$

The effect of domestic nominal and real shocks on real exchange rate in the short run can be solved as:

$$\frac{\partial R_t}{\partial m_t} = \frac{\partial e_t}{\partial m_t} - \frac{\partial (p_t - p_t^*)}{\partial m_t}$$

$$\frac{\partial R_t}{\partial m_t} = \frac{1}{\lambda\gamma} > 0 \tag{3.21a}$$

and

$$\frac{\partial R_t}{\partial y_t} = \frac{\partial e_t}{\partial y_t} - \frac{\partial (p_t - p_t^*)}{\partial y_t}$$

$$\frac{\partial R_t}{\partial y_t} = -\frac{\eta}{\lambda\gamma} + \eta \tag{3.21b}$$

The results suggest that a nominal shock causes real exchange rate depreciation, whereas a real shock has an ambiguous effect on real exchange rate in the short run.

In the long run, the effects of nominal and real shocks on real exchange rate are quite different from those in the short run. The effects of nominal and real shocks on real exchange rate in the long run can be formally presented as:

$$\frac{\partial \bar{R}}{\partial m_t} = \frac{\partial \bar{e}}{\partial m_t} - \frac{\partial(\bar{p} - \bar{p}^*)}{\partial m_t} = 0 \qquad (3.22a)$$

and

$$\frac{\partial \bar{R}}{\partial y_t} = \frac{\partial \bar{e}}{\partial y_t} - \frac{\partial(\bar{p} - \bar{p}^*)}{\partial y_t} = \left(\frac{1-\varphi}{\delta}\right) \qquad (3.22b)$$

From the results above, it can be concluded that the nominal shock does not affect the long-run real exchange rate, whereas the real income change causes the long-run real exchange rate to depreciate.

The Theory of Generalized Purchasing Power Parity

The large variability in real exchange rates since the collapse of the Bretton Wood system and the poor performance of modern structural models of exchange rate determination

are two factors that have motivated investigation about the validity of PPP. Some studies support PPP, while others show a departure from PPP. The latter has been studied with varying approaches. For instance, Vaubel (1978) attemped to explain it through the theory of optimum currency areas. He argued that the optimum currency area theory provides the basic factor behind the need for exchange rate adjustment. This argument relates to Mundell's (1961) article on optimum currency areas where he stated that when two regions experience the same type of real disturbance in the economy, they constitute the domain of a currency area. This is to say that the real exchange rate between the countries comprising the currency area should be stationary.

Vaubel argued that there is a practical problem in identifying regions or countries as a single currency area. He then offered four criteria for the determination of a currency area. First is factor mobility between the countries or regions. The criterion arises from Mundell's argument that real exchange rate deviation from its long-run value tends to become smaller, the factor mobility becomes higher. The second criterion is the diversification of external transactions. Countries whose external transactions are highly diversified will face small PPP deviations. Vaubel supported this criterion with the argument that if trade and capital movements among the members of a group of countries are highly diversified, the law of large numbers reduces the probability and size of change in each country's terms of trade as well as terms of finance. The third criterion is fiscal integration. The degree of fiscal integration is reflected in the net effect of export demand on BOP and on real exchange rate. Lastly is the openness criterion. Openness concerns the macroeconomic efficiency of nominal exchange

rate changes. The more open that the potential country members are to each other, the more likely that real exchange rate changes will be smaller. This approach, however, faced difficulty in the availability of appropriate measures for every criterion.

Recently, Enders and Hurn (1991a,1991b) developed the theory of Generalized-PPP. This theory is based on the time-series properties of real fundamental macroeconomic variables in determining real exchange rates and international interdependency among groups of countries that lead to a currency area. Enders and Hurn argue that there is no need for bilateral real exchange rates to follow stationary process as suggested by PPP. Instead, bilateral real exchange rates should follow nonstationary processes because fundamentals are mostly nonstationary variables. However, the theory offers that bilateral real exchange rates whose fundamentals are sufficiently interrelated will share common stochastic trends, even though bilateral real exchange rates themselves are nonstationary variables. These arguments are summarized in the basic tenants of Generalized-PPP, which are stated as follows:

> (1) The real fundamental macroeconomic variables determining real exchange rate (i.e. the forcing variables) tend to be nonstationary so that, in general, the real rates themselves will be nonstationary.
>
> (2) Within a currency area, the real fundamentals themselves will share common trends. In an appropriately defined currency area, the forcing variable will be sufficiently interrelated that real exchange rates will share a reduced number of common trends. Given that a vector of bilateral real rates share common trends, there exists (at least one) linear combination of the real rates which is stationary; thus, real rates will be cointegrated.

An Illustrative Model[1]

To study the relationships between the fundamental variables that underlie Generalized-PPP, it is beneficial to develop a three-country version of Dornbusch's overshooting model. The model is appropriate for studying exchange rate movement, the degree of price flexibility, and thus PPP. Consider that each country in the three-country (*j, k, l*) world presents the economy (as for country *j*), as follows:

$$m_{jt} = p_{jt} + \phi_j y_{jt} - \lambda_j i_{jt} \tag{3.23}$$

$$d_{jt} = \alpha_j y_{jt} + \eta_{jk} R_{jkt} + \eta_{jl} R_{jlt} + \alpha_{jk} y_{kt} + \alpha_{jl} y_{lt} - \tau_j i_{jt} \qquad j \neq k \neq l \tag{3.24}$$

$$p_{jt+1} - p_{jt} = \pi_j \left[d_{jt} - y_{jt} \right] \tag{3.25}$$

$$R_{jst} = e_{jst} + p_{st} - p_{jt} \qquad s = k, l \tag{3.26}$$

$$i_{jt} = i_{st} + E_t (e_{jst+1} - e_{jst}) \tag{3.27}$$

All variables except interest rates are in natural logs, and country subscripts *j, k,* and *l* run from 1 to 3. $\alpha, f, \eta, \phi, \tau$ and π are all positive constants.

[1]It is directly drived from Enders and Hurn (1991, a , b)

The interpretation of the economy model above can be explained as follows: (3.23) represents a country j money market equilibrium in which the domestic money stock (m_{jt}) is equiproportional to the domestic price level (p_{jt}), positively related to the level of domestic income, and negatively related to the nominal interest rate (i_{jt}). The income and interest elasticity of money demand are ϕ and λ, respectively.

In the country j goods markets, aggregate demand is represented by (3.24). This equation shows that the domestic demand for domestic goods (d_{jt}) varies positively with domestic and foreign output levels (y_{jk} and y_{jl}) and relative commodity prices or real exchange rates (R_{jk} and R_{jl}), and negatively with the domestic nominal interest rate (i_j). The marginal propensity to consume is α_j, whereas the foreign marginal propensities to import from j are f_{jk} and f_{jl}. The prices and interest elasticity demand for domestic output are η_{jk}, η_{jl}, and τ_j, respectively. Equation (3.25) is the price adjustment equation that shows how the price level responds to the excess demand pressure. Price level will fall (rise) if excess demand is negative (positive). Relative commodity prices, or real exchange rates, are defined as the domestic currency price of foreign goods relative to the price of domestic goods which are presented in (3.26). Only two real rates are determined independently in this model because $R_{jlt} = R_{jkt} - R_{lkt}$ and $R_{jkt} = -R_{kjt}$, and triangular arbitrage guarantees that only two nominal exchange rates are self-reliant because $e_{jlt} = e_{jkt} - e_{lkt}$ and $e_{jkt} = -e_{kjt}$.

Interest rate parity links nominal exchange rates and interest rates in the assets markets. This is presented in the uncovered interest parity relation. Equation (3.27) presents two independent interest rate parity conditions in this model. From (3.27), the uncovered

interest parity equates the interest rate differential with the expected rate of appreciation of the currency. $E_t(\,.\,)$ is the mathematical expectation operator, conditional on available and relevant information at time t.

To solve the model, first combine equation sets (3.24) and (3.25). The resulting three equations, the three money market equilibrium conditions from (3.23), the two interest rate parity conditions from (3.27), and any two definitions of real exchange rate from (3.26), all yield ten independent equations. Given the initial condition, it is possible to get solutions to the three prices and interest rate sequences (p_{jt}) and (i_{jt}), and the two real and nominal exchange rate sequences (R_{jst}) and (e_{jst}) in terms of the income and money supply processes.

With respect to real exchange rates, assume initial conditions such that $R_{12,0} = R_{13,0} = 0$. The model, then, gives two general solutions for the two independent real exchange rates that are linear in the income and money supply processes. These can be presented in matrices form as follows:

$$\begin{pmatrix} R_{12t} \\ R_{13t} \end{pmatrix} = H \begin{pmatrix} y_{1t} \\ y_{2t} \\ y_{3t} \end{pmatrix} + G \begin{pmatrix} m_{1t} \\ m_{2t} \\ m_{3t} \end{pmatrix} \tag{3.28}$$

where H and G are (2 x 3) matrices with elements $H_{mn}(L)$ and $G_{mn}(L)$, which are polynomials in the lag operator L. It is sufficient to note at this point that all real income and money supply processes are nonstationary without specifying the processes themselves. The

presentation of the solution in (3.28) has several meaningful implications for testing PPP. Consider $G_{mn}(L)$, and let $g_{mn}(q)$ represent coefficient q of the polynomial $G_{mn}(L)$. The nature of the model becomes such that[2]:

$$G_{mn}(L) = \sum_{q=1}^{q=p} g_{mn}(q) = 0 \qquad \forall m,n \tag{3.29}$$

Equation (3.29) implies that money supply shocks do not have permanent effects on real exchange rates even though they follow nonstationary processes. This means that real exchange rate will behave as a nonstationary processes because $H_{mn}(L)$ has no restrictions. Moreover, for finite demand elasticities η_{js} where $s = k,l$, the real shocks will have permanent effects on real exchange rates. This is to say that PPP will not generally hold.

To finish solving the model, consider the stochastic difference equation (3.28). The particular solution to this equation will provide the conditions for the long-run behavior of the real exchange rate series. However, an easier way to understand the long-run properties of this system is by considering the case for which all π_j approach infinity. To solve the system for the effects of permanent income shocks on real rates, impose the long-run properties on the model such that:

$$E_t(e_{jst+1} - e_{jst}) = 0 \tag{3.30a}$$

[2] The equation (3.7), intuitively, is the condition for long run money neutrality.

and

$$y_{jt} = d_{jt} \tag{3.30b}$$

For the long run solution, drop the time subscript and let i be the only world long run interest rate. By applying $R_{jl} = R_{jk} - R_{lk}$ and $R_{jk} = -R_{kj}$, (3.29), (3.30a) and (3.30b) into (3.28), the system can be written as follows:

$$\begin{bmatrix} \eta_{12} & \eta_{13} & -\tau_1 \\ -(\eta_{21}+\eta_{23}) & \eta_{23} & -\tau_2 \\ \eta_{32} & -(\eta_{31}+\eta_{32}) & -\tau_3 \end{bmatrix} \begin{bmatrix} R_{12} \\ R_{13} \\ i \end{bmatrix} = \begin{bmatrix} 1-\alpha_1 & -\alpha_{12} & -\alpha_{13} \\ -\alpha_{21} & 1-\alpha_2 & -\alpha_{23} \\ -\alpha_{31} & -\alpha_{32} & 1-\alpha_3 \end{bmatrix} \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} \tag{3.31}$$

The solution for R_{12} is:

$$R_{12} = \left(\frac{1}{\Omega}\right)\left(a_{11}y_1 + a_{12}y_2 + a_{13}y_3\right) \tag{3.32}$$

where

$$a_{11} = (1-\alpha_1)[\eta_{23}\tau_3 + (\eta_{31}+\eta_{32})\tau_2] + \alpha_{12}[\eta_{13}\tau_3 + (\eta_{31}+\eta_{32})\tau_1] + \alpha_{31}[\eta_{23}\tau_1 - \eta_{13}\tau_2],$$
$$a_{12} = -(1-\alpha_2)[\eta_{13}\tau_3 + (\eta_{31}+\eta_{32})\tau_1] - \alpha_{12}[\eta_{23}\tau_3 + (\eta_{31}+\eta_{32})\tau_2] + \alpha_{32}[\eta_{23}\tau_1 - \eta_{13}\tau_2],$$
$$a_{13} = \alpha_{23}[\eta_{13}\tau_3 + (\eta_{31}+\eta_{32})\tau_1] - \alpha_{13}[\eta_{23}\tau_3 + (\eta_{31}+\eta_{32})\tau_2] + (1-\alpha_3)[\eta_{23}\tau_1 - \eta_{13}\tau_2],$$
$$\Omega = \tau_1[\eta_{21}(\eta_{31}+\eta_{32}) + \eta_{23}\eta_{31}] + \tau_2[\eta_{12}(\eta_{31}+\eta_{32}) + \eta_{13}\eta_{32}] + \tau_3[\eta_{13}(\eta_{21}+\eta_{23}) + \eta_{12}\eta_{23}] > 0.$$

Without giving numerical value to the parameters, the signs of a_{11}, a_{12}, and a_{13} are ambiguous. A condition for $a_{11} > 0$ and $a_{12} < 0$ is $\tau_1 \eta_{23} = \tau_2 \eta_{13}$.

The fundamental result, however, is that the real exchange rate processes have linear relationships with the nonstationary real income processes. This is to say that the highest order of integration of the elements in the vector of income processes becomes the order of integration of the system. However, real exchange rates will not have a linear relationship unless restrictions are applied on the income processes. The optimum currency area arguments assume that the stochastic trends in forcing variables, $y_i = [y_1, y_2, y_3]'$, are interrelated, despite the economic differences among the countries in the true currency area (Mundell, 1961). The notion is that currency areas are determined to be in a true economic region if they experience the same types of real economic shocks.

The key to Generalized-PPP, therefore, is the interrelationships among the various output disturbances. This suggests that it is convenient to apply the common trends representation developed in Stock and Watson (1988) to the system. This means that the vector of forcing variables, y_i, can be represented by a single common stochastic trend, $\hat{y}_i$. Thus, y_i can be represented as:

$$y_i = \begin{bmatrix} \delta_{11} & \delta_{12} & \delta_{13} \\ \delta_{21} & \delta_{22} & \delta_{23} \\ \delta_{31} & \delta_{32} & \delta_{33} \end{bmatrix} \begin{bmatrix} \hat{y}_1 \\ \hat{y}_2 \\ \hat{y}_3 \end{bmatrix} \qquad (3.33a)$$

or

$$y_i = \delta \hat{y}_i \qquad (3.33b)$$

Substituting (3.33a) into (3.31), the behavior of the real exchange rate in the system is determined by:

$$\begin{pmatrix} R_{12} \\ R_{13} \end{pmatrix} = \left(\frac{1}{\Omega}\right) \begin{pmatrix} a_{11}\delta_{11} + a_{12}\delta_{12} + a_{13}\delta_{13} \\ a_{21}\delta_{21} + a_{22}\delta_{22} + a_{23}\delta_{23} \end{pmatrix} \hat{y}_i \qquad (3.34)$$

where a_{2i}, $i = 1,2,3$, is defined analogously to a_{1i} in (3.32). An important implication of (3.34) is that a linear relationship of the two real rates is stationary. More generally, as long as the rank (δ) $\leq (m - 1)$ in the case of δ is the $(m + 1)$ x $(m + 1)$ matrix, there exists a linear combination of real rates which is stationary. Furthermore, the cointegrating vector will be unique if the rank (δ) is equal to m- 1. To express this argument, it is useful to reform (3.33) such that:

$$R_{12} = \beta R_{13} \qquad (3.35)$$

where

$$\beta = \left[\frac{a_{11}\delta_{11} + a_{12}\delta_{12} + a_{13}\delta_{13}}{a_{21}\delta_{21} + a_{22}\delta_{22} + a_{23}\delta_{23}}\right]$$

Equation (3.35) shows that the two real exchange rates are cointegrated in the sense of Engle and Granger (1987), where β is the cointegrating scalar which is a combination of goods market demand parameters.

In the system of the $m + 1$ country world, (3.34) can be extended to the case of m independent bilateral real exchange rates. Equation (3.34) becomes:

$$R_t = \Lambda \hat{Y}_t \tag{3.36}$$

where R is the (m x 1) vector of independent real exchange rates and Λ is the (m x $m + 1$) vector of cointegrating parameters, which are functions of the goods market demand parameters, and $\hat{Y}$ is the (($m + 1$) x 1) vector of stochastic trends. The resulting long-run equilibrium relationship, which is called Generalized-PPP, may be formed such that:

$$R_{12t} = \beta_{13} R_{13t} + \beta_{14} R_{14t} + \ldots + \beta_{1m} R_{1mt} \tag{3.37}$$

where R_{1i} where $i = 2,3, \ldots, m$, are the bilateral real exchange rates in period t between country 1 (as a base country) and country i; and β_{1i} are the parameters of the cointegrating vector.

In terms of the anti-log, (3.37) can be rewritten as:

$$\left[\frac{E_{12t}P_{2t}}{P_{1t}}\right]=\left[\frac{E_{13t}P_{3t}}{P_1}\right]^{\beta_{13}}\left[\frac{E_{14}P_{4t}}{P_1}\right]^{\beta_{14}}\cdots\left[\frac{E_{1m}P_{mt}}{P_1}\right]^{\beta_{1m}} \tag{3.38}$$

where P_{it} is the price of country i in period t and $E_{1i,t}$ is the nominal exchange rate between country i and the base country in period t.

Equations (3.37) and (3.38) offer the notion that the real exchange rates between two countries is a weighted average of real exchange rate of the countries in the currency area in which the weights are functions of the goods market demand parameter, and not traditional "trade weights." The special case is when all β_{1i} are zero; then, Generalized-PPP becomes the traditional long-run relationship among domestic prices, foreign prices, and the exchange rate.

Review of Empirical Study

Before discussing the empirical results of various studies, it is important to consider the method of computing PPP itself. The value of parity relies upon the kind of price index selected in computation. It will vary with the weighting pattern of the price measures as well. Different weighting schemes for the countries' price level will, in general, lead to different parities, none of which can be expected to equal the "true" parity, which equalizes all individual commodity prices internationally. This condition exists even if the price measures refer to traded goods alone and there are no trade restrictions or transportation costs and no imperfection in the arbitrage process.

With regard to the choice of prices indices, Samuelson (1964) argued that the relative export price index is not appropriate for computing PPP. If the real exchange rate is interpreted as the relative price of importable goods in terms of exportable goods, the existence of money neutrality will rule out changes in the real exchange rate. Another argument against the use of the export price index in computing PPP relates to the degree of competitiveness of countries in the world market. The average export price of a country may continue to be aligned to international trends in order to maintain export market share, even though domestic costs have moved up relative to those in other countries.

The alternative of using a unit labor cost is also considered by some economists. This method would appear to remedy more completely the defect of using export price. Combining data for hourly wages and output per man-hour should emerge as reliable information on PPP, which is as an equilibrium relationship. At the conceptual level, it would be desirable to have information on total factor costs and productivity rather than on just the major factor of production (Thygesen, 1978). In the Ricardian framework, Samuelson (1964) pointed out that production cost parity is not acceptable because such an index includes the borderline goods that are likely to be intermediate between broad limits. However, these borderline goods should not always to be in the middle as a consequence of demand shocks. The shift in borderline goods will cause a change in real and nominal exchange rates.

The GDP deflator is considered to be appropriate in measuring PPP because the GDP deflator is the most broadly based and uniform as calculated price index. However, it is not free of problems. Regardless of availability shortcomings in the GDP deflator, Khan (1986)

argued that it could be the cause of major problems in the case of developing countries. The imputation of value added at constant prices for certain types of goods and services may not be sufficiently reliable for most developing countries. Moreover, the GDP deflator may exclude certain types of cost such as the cost of nonmanufacturing intermediate inputs in the manufacturing sector. Similar to the GDP deflator, the consumer price index (CPI) is also broadly based. There is a presumption that a formulation using CPI will offer the sharpest test of PPP because this index includes nontradable goods and services to a much larger extent than does the wholesales price index (WPI). Besides, CPI is readily and quickly available in nearly all countries on monthly, quarterly, and annual bases. In fact, CPI is often the only reliable price index available in developing countries. As with the other measures, CPI also has problems, particularly for developing countries. It is a meaningful proxy only for short-run change in relative cost. It does not directly reflect the profitability of the primary producing sectors and its coverage tends to be concentrated in urban areas of the countries (Khan, 1986; Thygesen, 1978).

Another candidate for using price index to calculate PPP is WPI. Some of the conceptual difficulties also apply to this price index, which measures heavily weighted prices of tradable goods. WPIs, however, give considerably greater weight to domestic cost elements so that conformity to a parallel price trend in different countries cannot be interpreted mainly as the result of efficient commodity arbitrage. This price index covers not only currently traded export goods, but also import-competing goods and a wide variety of goods that are potentially tradable. It is legitimate to consider WPIs as a useful candidate

series for measuring PPP (Thygesen, 1978). In the presence of money neutrality, however, any kind of price index such as the GDP deflator, WPI, CPI , and others would not matter.

Tests of whether PPP is supported by the evidence on floating exchange rate regimes have been conducted in various ways. One way to investigate PPP is to test the validity of commodity arbitrage as a component of PPP by computing PPP for highly desegregated price indices. A second way is based on the hypothesis that the real exchange rate should be constant over time and independent of nominal exchange rate movement if PPP holds. Some studies use regression analysis to test the relative and absolute versions of PPP. And recently, most studies have applied time-series econometrics to test the validity of PPP (McDonald, 1989).

Two divergent views are still in question about the PPP hypothesis. The first is the random walk PPP hypothesis, and the second is the PPP long-run phenomenon. New findings in statistical methods of testing such as unit root and contegration tests force economists to reconsider previous empirical studies. Conventional tests of PPP, in general, ignore the fact that the level of the spot exchange rate and domestic and foreign price indices are typically nonstationary. This fact could lead to unacceptable results because standard critical values based on a normality distribution assumption are inappropriate for nonstationary variables.

Adler and Lehman (1983) examined the long-run PPP hypothesis using the Martingale Model of real exchange rate. They argued that expectation form has a significant role in the validity test of the relative form of PPP. Deviations from PPP will follow a martingale if an expectation is rational. And, empirically, deviations are cumulative and persist for long

periods of time and appear to cycle irregularly around parity. Adler and Lehman's study was conducted using monthly data for exchange rates and CPI as well as annual data for ten industrial countries. They also used annual WPI. Their findings give strong evidence to reject the long-run PPP phenomenon in both monthly and annual data.

Recognizing the nonstationary properties of variables, Enders (1988) and Corbae and Ouliaris (1988) used unit root and cointegration tests for testing the validity of PPP. Enders studied the validity of PPP under fixed and flexible exchange rate regimes between the United States and major U.S. trading partners such as Canada, Germany, and Japan in the form of WPI, using monthly data. His results of the autoregressive integrated moving average (ARIMA) tests and cointegration tests give mixed support for the PPP hypothesis. In the Bretton Wood and flexible exchange rate periods, the point estimates of the long-run real exchange rate for all countries studied from ARIMA tests did not significantly differ from unity. And point estimates indicated that real exchange rates are convergent, but standard errors are sufficiently large so that it is not possible to reject the random walk hypothesis. From cointegration tests, point estimates of long-run real rates are far from unity. However, strong evidence of cointegration between US and Japanese price levels were found for the Bretton Wood period, while cointegration between US-Canadian price levels had weak support.

Corbae and Ouliaris (1988) found that the null hypothesis of no cointegration can not be rejected for all countries studied. They concluded that this violates the long-run absolute version of PPP. Their study used the Canadian dollar, German deutsche mark, Italian lira,

Japanese yen, and UK pound against the US dollar, and monthly CPI data. Using the same method as Enders, and Corbae and Ouliaris, Kim and Enders (1991) found that there was little evidence supporting the stationary hypothesis of real exchange rates for Pacific Rim nations. Their most interesting finding was that money shocks cause temporary, not permanent, changes in real exchange rates.

Patel (1991) examined the validity of the absolute version of PPP. Besides using the Engle and Granger (1987) cointegration method to test for PPP, he also applied the Stock and Watson (1988) method. Real exchange rate was computed based on WPI for six industrial countries: the United States, the United Kingdom, Canada, West Germany, the Netherlands, and Japan. Patel selected these countries by assuming that PPP would likely hold for developed, relatively free market economies. His results provide support for the random walk PPP hypothesis. Interestingly, he brought forth the question about the source of shocks that create departures from PPP. His conjecture was that the shocks might be nonmonetary in origin, such as related to the "Dutch disease" phenomenon. Fisher and Park (1991) tested the validity of the weak version of PPP based on WPIs and CPIs. They concluded that relative PPP describes the behavior of almost all the major currencies, but the stationary hypothesis of real exchange rate was rejected. Disequilibrium adjustment occurs in the foreign exchange market, not in the goods market.

Enders and Hurn (1991a, 1991b) found that there are long-run equilibrium relationships among the real exchange rates of many industrialized nations when the United States is the base country. In the case of Japan as the base country, Generalized-PPP holds

for each of the Pacific Rim nations when combined with four large nations. For the large countries alone, Generalized-PPP does not hold. This result shows that interdependency among the Pacific Rim nations with large countries is weak but significant.

Whereas the empirical studies discussed above support the random walk PPP hypothesis, some economists have also documented support for the PPP long-run phenomenon. Hakkio (1984) reexamined PPP theory in a multiple exchange world. He argued that many of the empirical studies that support the random walk PPP hypothesis use a bilateral real exchange rate model that ignores international interdependency. He suggests estimating PPP using a system estimation to account for the correlation of error terms across countries and for serial correlation within countries. Real exchange rates for his study were computed based on an absolute version of PPP using CPIs for the British pound, Canadian dollar, French franc, and Japanese yen, all against the US dollar. His study fails to reject that PPP holds in several currencies simultaneously.

In response to the negative results obtained in some empirical studies such as Hakkio (1986), Abauf and Jorion (1990) argued that such results reflect the poor power of the test rather than evidence against PPP. To support their argument, they chose to use the same data Adler and Lehman (1983) used for their study. Abauf and Jorion proposed to extend the Dickey and Fuller (1979) unit root test to a system of univariate auto regression, estimatation jointly by generalized least squares such as the seemingly unrelated regression estimated method. The simulation was conducted to derive an empirical distribution. Their results suggest that the first autoregression coefficient approximately equals 0.98 - 0.99 for monthly

data over the floating exchange rate period. A 50 percent over-appreciation of a currency with respect to PPP would take between three to five years to be cut in half, whereas a period of three years is needed for such a reversal in the case of annual data over the period 1900-72. Therefore, PPP might be held in the long run.

The attention in the prsent empirical study has moved to the investigation of the long run PPP phenomenon. PPP does not provide an explanation for short-run movements in exchange rate, as is the generally accepted consensus. The economic rationale for this failure is that over a short period of time, large shocks and structural change effects in the economy may shift real exchange rates from their long-run equilibrium positions. Self-correcting mechanisms built into the economy help produce a proportionality between the exchange rate and relative price over time. For this reason, some economists tend to study the behavior of real exchange rates in the long run.

Huizinga (1987) applied two procedures to measure long-run movements in real exchange rates and to determine if these movements differ from those predicted by the random walk model. The first is the spectral procedure. The second is the regression procedure, which is used to compute estimates of serial correlation for the change in real exchange rates over certain time spans. Real exchange rates are formed using CPIs for ten industrial country currencies. Moreover, the study was conducted in a univariate and also in a multivariate, framework. Huizinga's findings support theory that PPP holds in the long run. In addition to evidence on the long-run mean-reverting behavior of real exchange rates, he found no evidence to support the contention that long-run movement of real exchange rates is

restricted by permanent real shocks, as some theories suggest. The notion that long-run movements of real exchange rates reflect those of nominal exchange rates also received no support from the data.

Enders (1989) applied unit roots and the cointegartion method in testing the validity of PPP for the period before World War I in the case of the United Kingdom and the United States. For the greenback and gold standard periods, real exchange rates were convergent, although the gold standard allows for convergence at a greater significance level. An interesting result is that PPP held during a period in which there was substantial real economic growth and limited money growth; that is, inflation was under control. These results were supported by Diebold, Husted, and Rush (1991), who studied deviations from parity using a long-memory model such as the Autoregressive Fractional Integrated Moving Average (ARFIMA (p,d,q)) representation. This model allows for subtle forms of mean reversion. Their study used annual real exchange rates based on both CPIs and WPIs for six European countries during the gold standard era.

Kim (1990) found different results for different forms of real exchange rates. Using the cointegration technique, he rejected the hypothesis that real exchange rates follow a random walk, except for the case of the Canadian dollar, Japanese yen, and British pound. In combination with CPI, estimation of error correction models suggests that deviations from PPP significantly affect exchange rates in all cases where cointegration is confirmed.

Instead of the Dickey-Fuller test for unit roots, Whitt (1992) applied Sims' test for the presence of a unit root. Whitt's test is based on the Bayesian posterior odds ratio and is

designed to discriminate between a unit root and a large but stationary autocorrelation coefficient. This test was applied for monthly CPI data from a flexible exchange regime alone and then for annual CPI and WPI data for the Bretton Wood and flexible exchange rate periods. All Whitt's results show that Sims' test consistently favors the stationary, not the random walk, hypothesis. These results are different Kim's findings for the case of using CPI to calculate PPP.

CHAPTER 4. THE UNIT ROOT, COINTEGRATION TESTS WITH STRUCTURAL CHANGE

As discussed in the previous chapter, studies of PPP have reported mixed results. Some studies support PPP, while others show departures from PPP. In light of the mixed empirical findings that consist of both acceptance and rejection of PPP, the importance of the time-series properties of such deviations as well as those of the variables themselves are of interest to this study. The attention of this study to the validity of the PPP hypothesis focuses on investigating the long run properties of PPP.

The long-run equilibrium of real exchange rates entails a system of co-movements among real exchange rates. In this context, only a stable equilibrium is of interest because unstable equilibria will not persist, given that there are stochastic shocks to the economy. This leads to the statistical concept of equilibrium, which states that an equilibrium relationship $f(x_1, x_2) = 0$ holds between two variables x_1 and x_2 if the amount of $\varepsilon_t \equiv f(x_{1t}, x_{2t})$ by which actual observations deviate from this equilibrium is a median-zero stationary process. That is to say, the "error," or discrepancy, between two outcomes and the postulated equilibrium has a fixed distribution, centered on zero, that does not change over time. Because this error represents shocks that are constantly occurring and affecting economic variables, however, in a real economic system there is no systematic tendency for this error to diminish over time. It would fall away to zero only if the shocks were to ease.

This statistical concept of equilibrium, therefore, holds automatically when applied to series that are themselves stationary.

This chapter investigates such long-run relationships on real exchange rates to study the validity of PPP and Generalized-PPP. Most empirical studies about the validity of PPP and Generalized-PPP do not account for structural change. The misspecification problem from structural breaks, however, has been an issue related to stationary investigations such as the unit root test. As shown by Perron (1989), a structural break may make an otherwise stationary variable appear to be a unit root process. In this context, it is important to account for structural change in studying the validity of PPP and Generalized-PPP in the economic system. Besides the lack of consideration of structural change, most studies of PPP and real exchange rates have been related to developed countries. The presumption that initiated this trend is that PPP works well in a relatively free market economy. However, this does not mean that the concept only applies to developed countries. The following presents further study of the relationship of PPP and Generalized-PPP (1) for Indonesia's economy in relation to its trading partners, (2) among Indonesia's trading partners, and (3) among the members of the Association of Southeast Asian Nations (ASEAN).

Tests of Purchasing Power Parity

To test the PPP relationship in the Indonesian economy, the unit root test in the presence of structural change was applied. The methodologies that follow for the unit root test are those of Perron (1989).

The Unit RootTest and Real Exchange Rates

To test the PPP hypothesis, rewrite (3.3) in the econometric model as:

$$E_t P_t^* - \varphi P_t = s_t \tag{4.1}$$

where E_t is the rupiah price of the foreign currency in time t, P_t^* is the foreign price in time t, P_t is the Indonesian price in time t, s_t is a stochastic disturbance that represents deviation from PPP, and φ is a constant.

The long-run PPP hypothesis requires that $E_t P_t^*$ equals P_t, which implies that $\varphi = 1$ and s_t is stationary with a mean equal to zero. All E, P^*, and P are endogenous variables that are jointly determined. This leads us to consider reformulating PPP in terms of the real exchange rate to preclude the possibility of using an instrument variable in estimating (4.1). Rearranging (4.1) gives:

$$E_t P_t^* / P_t = \varphi + s_{1t} \tag{4.2a}$$

and

$$r_t = \varphi + s_{1t} \tag{4.2b}$$

where r_t is the real exchange rate and s_{1t} is a stochastic disturbance that represents the deviation of the real exchange rate from its equilibrium value. In this form, long-run PPP holds if s_{1t} is stationary. φ is a constant defined as the long-run value of the real exchange rate.

Now, suppose that s_{1t} is an indeterministic covariance stationary stochastic process. By the Wold decomposition theorem, s_{1t} has an infinite order moving average representation that can be approximated by a finite autoregressive representation under certain conditions. In the case that s_{1t} is a finite autoregressive integrated moving average (ARIMA (n, 0, 0)), the underlying process for the real exchange rate movement, therefore, is suggested by:

$$r_t = \beta_0 + \beta_1 r_{t-1} + \ . \ . \ . \ + \beta_n r_{t-n} + \xi_t \tag{4.3}$$

where ξ_t is a serially uncorrelated stochastic disturbance with zero mean. Given this specification, the long-run properties of PPP require that all characteristic roots of (4.3) lie within the unit circle.

This study tests whether real exchange rates follow stationary processes. Consideration is given to the fact that using standard critical values based on a normality

distribution assumption is inappropriate for nonstationary variables. Dickey and Fuller (1979, 1981) introduced methodology for testing a unit root in the ARIMA representation and provided critical values for such tests in the case of nonstationary time series with multiple roots. The application of this test was improved when Said and Dickey (1984) proposed a generalization of the Dickey-Fuller procedure. Said and Dickey, however, yield test statistics with the same asymptotic critical values as those tabulated by Dickey and Fuller. This test can be applied to models in which the orders of the ARIMA polynomials in the error process do not need to be identified. However, the procedure requires that error processes are free of serial correlations. Phillips (1987) and Phillips and Perron (1988) have offered a more general procedure for testing a unit root in a time-series model in which the restrictions on error processes are such that serial correlation is relaxed.

Within the regression model framework, the change in one or more of the parameters indicates a structural change. Misspecification problems associated with a structural break have been related to unit root tests. The methods developed by Dickey and Fuller (1979, 1981), Phillips (1987), and Phillips and Perron (1988) are unable to detect such problems (Perron, 1989). As Perron (1989) showed, a structural break may make an otherwise stationary variable appear to be a unit root process. In the presence of structural change, he proposed a formal statistical test of the null hypothesis for the unit root in the spirit of "intervention analysis."

Perron considers three different alternatives for testing unit roots in the presence of regime shifts. The first regression is used to test unit roots in time-series models in the

presence of a one-time jump in the mean of a unit root process. The second alternative tests in the presence of a change in intercept, and the third tests in the presence of a one-time jump in both the mean and the intercept of a unit root process. All three tests can be presented formally in terms of the level of real exchange rate (R).

Let the presence of a structural change in the Indonesian economy at time t be $t = \tau+1$. For the first alternative test, consider the null hyphotesis of a one-time change in the mean of a unit root process against the alternative hypothesis of a one-time jump in the intercept of a trend stationary process. Formally, the null and alternative hypotheses are:

$$H_0:\ R_t = \mu_0 + R_{t-1} + \alpha_0 D_1 + \varepsilon_t \qquad (4.4a)$$

and

$$H_a:\ R_t = \mu_a + \beta t + \alpha_a x_t + \varepsilon_t \qquad (4.4b)$$

where R is the log of real exchange rate (r); D_1 is a dummy variable such that $D_1 = 1$ if $t = \tau+1$, and zero otherwise; x_t is a dummy variable such that $x_t = 1$ for $t > \tau$, and zero otherwise; and μ_0, μ_a, α_0, α_a, and β are parameters of the null and alternative hypotheses.

The second alternative considers the null hypothesis of a permanent shift in the drift term against the alternative of a change in the slope of the trend. In this case, the null and alternative hypotheses are:

$$H_0:\ R_t = \mu_0 + R_{t-1} + \mu_1 D_2 + \varepsilon_t \qquad (4.5a)$$

and

$$H_a:\ R_t = \mu_a + \beta_1 t + \beta_2 D_3 + \varepsilon_t \qquad (4.5b)$$

where $D_2 = 1$ if $t \rangle \tau$, and zero otherwise. Equation (4.5a) implies that the $\{R_t\}$ sequence is generated by $\Delta R_t = \mu_0 + \varepsilon_t$ up to period $t = \tau$, and by $\Delta R_t = (\mu_0 + \mu_1) + \varepsilon_t$ as $t \rangle \tau$. $D_3 = t - \tau$ for $t \rangle \tau$, and zero otherwise. From (4.5b), the slope of the trend is β_1 for $t \leq \tau$ and $(\beta_1 + \beta_2)$ for $t \rangle \tau$.

The third alternative combines the two cases above. Formally, the null and alternative hypotheses are:

$$H_0: R_t = \mu_0 + R_{t-1} + \mu_1 D_1 + \mu_2 D_2 + \varepsilon_t \qquad (4.6a)$$

and

$$H_a: R_t = \mu_a + \beta_1 t + \beta_2 D_3 + \alpha_a x_t + \varepsilon_t \qquad (4.6b)$$

where D_1, D_2, D_3, and x_t are as defined above.

In pursuing the test, the raw series $\{R_t\}$ is first detrended according to one of the alternatives, in first (I), second (II), or third (III). Let $\{\tilde{R}_t^i\}$, i = I, II, III, be the residuals from a regression of R_t as follows:

$$\text{For } i = \text{I}, \; R_t = \mu_a + \beta t + \alpha_a x_t + \tilde{R}_t \tag{4.7a}$$

$$\text{For } i = \text{II}, \; R_t = \mu_a + \beta_1 t + \beta_2 D_3 + \tilde{R}_t \tag{4.7b}$$

$$\text{For } i = \text{III}, \; R_t = \mu_a + \beta_1 t + \beta_2 D_3 + \alpha_a x_t + \tilde{R}_t \tag{4.7c}$$

Furthermore, let $\hat{\tilde{\alpha}}^i$ be the least squares estimator of $\tilde{\alpha}^i$ in the following regression :

$$\tilde{R}_t^i = \tilde{\alpha}^i \tilde{R}_{t-1}^i + \tilde{e}_t \quad i = \text{I, II, III} \quad t = 1,2,\ldots T \tag{4.8}$$

where under the null hypothesis of a unit root, the theoretical value of $\tilde{\alpha}^i = 1$. In the case that the residuals ($\tilde{e}_t$) are identically and independently distributed, the limiting distribution of $t_{\tilde{\alpha}^i}$ depends on the proportion of observations occurring prior to the break, $\lambda = \tau/T$, where T is the total number of observations. The critical values for alternatives I, II , and III are presented in Perron (1989) in Tables IV, V, and VI, respectively.

For the case that the residuals, $\tilde{e}_t$, are serially correlated, the extensions are necessary. Two approaches are possible. One is to follow the method suggested by Phillips (1987) and Phillips and Perron (1988). The other is to use the method suggested by Dickey and Fuller (1979, 1981) and Said and Dickey (1984). The latter approach includes the application of the augmented Dickey-Fuller test. This framework was formed by the regression:

$$\Delta\tilde{R}_t^i = \tilde{\alpha}^i \tilde{R}_{t-1}^i + \sum_{j=1}^{k} c_j \Delta\tilde{R}_{t-j} + \tilde{e}_t \qquad i = \text{I, II, III} \tag{4.9}$$

where $\Delta\tilde{R}_t^i = \tilde{R}_t^i - \tilde{R}_{t-1}^i$, and lag k is sufficiently large for $\tilde{e}_t$ to be serially uncorrelated. The limiting distributions for $t_{\tilde{\alpha}^i}$ in this case, then, are the same as when the errors are identically and independently distributed and regression (4.8) is used in the test.

Data

Having presented the method used to test the unit root for Indonesian real exchange rate time-series data in the presence of structural change, it is time to explain how the series are constructed. Three different series for Indonesian real exchange rates were constructed for this study. The first series (series I) was constructed by multiplying the foreign WPI by the rupiah price of the foreign currency and then dividing by the IndonesianWPI. The justification for constructing the real exchange rate in this way is discussed in the previous

chapter. Instead of using the Indonesian WPI as was done in the first series, the second series (series II) was constructed using the Indonesian wholesale price excluding the oil price. The intention was to observe the behavior of the Indonesian real exchange rate when it does not account for oil price. As mentioned in Chapter 2, oil exports were once a major component of total Indonesian exports, but this role has been reduced by policy reforms. The real exchange rate for the third series (series III) was constructed using the nominal exchange rate with respect to each country's foreign WPI and the Indonesian CPI. All price data are normalized to be 100 as of January 1985. Using monthly data from *International Financial Statistics*, the real exchange rate for seven of Indonesia's major trading partners--the United States, Germany, Japan, South Korea, the Philippines, Singapore, and Thailand--were constructed for all three data series. The sample period is January 1974 through October 1992.

Empirical Results

As discussed in the previous chapter, the structural change in the Indonesian economy started with the change in Indonesia's exchange rate system that accompanied with the adjustment of the rate. This condition justifies the choice of the first alternative test of Perron (1989) in investigating the validity of PPP in this study. An augmented Dickey-Fuller test was used with the detrended the series. A lag of one was chosen for all the tests ensuring that disturbances are serially uncorrelated. The point of structural break was set at March 1983.

Table 4.1. The Perron unit root test in the presence of structural change.

Model : $r_t = \mu_a + \beta T + \alpha_a x_t + \tilde{r}_t$ $\quad\quad$ $\Delta\tilde{r}_t = \tilde{\alpha}\tilde{r}_{t-1} + \sum_{i=1}^{k} c_i \Delta\tilde{r}_{t-i} + \tilde{e}_t$

Real Exchange Rate	Series I			Series II			Series III		
	k	λ	$t_{\tilde{\alpha}}$	k	λ	$t_{\tilde{\alpha}}$	k	λ	$t_{\tilde{\alpha}}$
United States	1	0.48	-2.49	1	0.48	-3.42	1	0.48	-3.05
Germany	1	0.48	-1.62	1	0.48	-1.98	1	0.48	-2.10
Japan	1	0.48	-1.82	1	0.48	-2.23	1	0.48	-2.05
South Korea	1	0.48	-2.41	1	0.48	-2.63	1	0.48	-2.79
Philippines	1	0.48	-2.73	1	0.48	-3.35	1	0.48	-3.34
Singapore	1	0.48	-3.14	1	0.48	-3.60	1	0.48	-2.94
Thailand	1	0.48	-2.14	1	0.48	-2.83	1	0.48	-2.97

Note: The critical value for λ = 0 .4 with a significance level of 5 % is -3.72, while for λ = 0 .5 with a significance level of 5 %, the critical value is -3.76 (Table IV b in Perron, 1989).

The results of the unit root test of the real exchange rate for each country in the three series are reported in Table 4.1. The null hypothesis that the real exchange rate is a unit root process cannot be rejected at the 5 % significance level for all real exchange rates in all three data series. This means that the PPP hypothesis does not hold in all the countries studied.

The Test of Generalized Purchasing Power Parity

So far, the research shows that the bilateral real exchange rates of interest to this study exhibited nonstationary stochastic processes. This result was expected and predicted by the

theory of Generalized-PPP. This stage, then, leads to an investigation of whether Generalized-PPP holds in the group of countries hypothesized to constitute an optimum currency area. As discussed in previous chapters, the theory of Generalized-PPP holds when there exists at least one stationary linear combination of the various bilateral real exchange rates in a particular group of countries.

The theory of Generalized-PPP, therefore, implies that more than one stationary linear combination of various bilateral real exchange rates could exist for the countries that constitute an optimum currency area, as defined by Mundell (1968). This implication means that the procedure for testing the validity of Generalized-PPP must address the issue of multiple cointegrating vectors. This leads to elimination of procedures such as the two-step procedure for testing for the existence of cointegration suggested by Engle and Granger (1987). The methods based on the cointegrating rank, however, are appropriate. One commonly used method is Johansen's maximum likelihood procedure (Johansen, 1988, 1991).

The issue of structural change has been of interest to many economists. In investigating the PPP relationship, Ballasa (1964) has argued the issue of structural change (e.g., changes in the supply and demand relationship) as one reason for purchasing power disparities. Another argument that brings out this issue within macroeconomics is the so-called Lucas critique, which discusses parameter changes. The idea is that the parameters of macroeconomic models are determined by the expectations of economic agents involved in forming future economic policies. If policies change, so do the expectations and related parameters. Therefore, the presence of structural change in the economic system must be

accounted for in investigating the validity of Generalized-PPP and PPP, if they exist. Otherwise, the procedure could lead to misspecification problems.

This study applies Johansen's method, which accounts for structural change in the economy of a base country in constructing a bilateral real exchange rate. Related studies about the validity of Generalized-PPP, such as Enders and Hurn (1991a, 1991b), also used Johansen's procedure. Those investigations, however, did not consider the issue of structural change.

This study attempts to test for Generalized-PPP in specified groups of countries in the presence of structural change. First, the description of the econometric model is presented and applied to the discussion of the groups of countries studied. Then, a discussion of the cointegration test for Generalized-PPP and diagnostic tests for error terms in the model are discussed.

Econometric Model[1]

To test for Generalized-PPP, assume that the n-dimensional time-series real exchange rates (R_t) fit a vector autoregressive representation (VAR), such that:

$$R_t = \pi_1 R_{t-1} + \pi_2 R_{t-2} + \ldots + \pi_k R_{t-k} + C + \phi D_t + \varepsilon_t \quad t = 1, 2, \ldots, T \qquad (4.10)$$

[1] For more discussion about cointegration, see Banerjee A, J.J Dolado, J.W Galbraith and D.F Henry (1993).

where ε_t is an independently identically normal distributed n-dimensional vector with zero mean and covariance matrix Ω. $R_t, R_{t-1}, \ldots, R_{t-k}$ are vectors of bilateral real exchange rates, C is a vector of the constants, and D_t is a dummy variable that accounts for structural change.

Considering that the bilateral real exchange rates used for this study are all nonstationary processes in the presence of structural change, the VAR system in (4.10) can be expressed in first-difference form as:

$$\Delta R_t = \sum_{j=1}^{k-1} \Gamma_j \Delta R_{t-j} + \pi R_{t-k} + C + \phi D_t + \varepsilon_t \tag{4.11}$$

where $\Delta = (1 - L)$

$$\Gamma_j = -\left(I - \pi_1 - \ldots - \pi_j\right), \; j = 1, \ldots, k-1$$

$$\pi = -\left(I - \pi_1 - \ldots - \pi_k\right) \tag{4.12}$$

Econometric model (4.11) is a multivariate version of the augmented Dickey-Fuller model for testing unit roots. In model (4.11), the matrix π, as defined in (4.12), plays a key role in cointegration. We can eleborate on three distinct cases with respect to the rank of the π matrix such that: [2]

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[2]Example for cases (I) and (II). Let n = 2. If $\pi_2 = 0$ and $\pi_1 = I$, then $\left(I - \pi_2 - \pi_1\right) = 0$. In this case, all elements of R_t are unit root processes, and $\left(I - \pi_1 - \pi_2\right)$ is rank zero. However, if $\pi_2 = 0$ and $\pi_1 = \left(\rho_1, \ldots, \rho_k\right)$, where $\left|\rho_j\right| < 1 \;\; \forall j, \; j = 1, \ldots, k$, then $\left(I - \pi_1 - \pi_2\right)$ is full rank and all element of R_t are stationary AR(1) process.

(i) rank $(\pi) = n$, full rank, any linear combination of R_t will be stationary.

(ii) rank $(\pi) = 0$, matrix of zeros, any linear combination of R_t will be a unit root and therefore nonstationary.

(iii) $0 <$ rank $(\pi) = r <$ n, there exist $(n \times r)$ matrices α and β such that $\pi = \alpha\beta$.

In this case, rank of π, r, is the number of linearly independent cointegrating relations among variables in R_t.

In case (iii), the matrix π is expressed as the product of two $(n \times r)$ matrices, α and β such that $\pi = \alpha\beta$. Although ΔR_t is stationary and R_t is nonstationary as a vector process, this study assumes that the r linear combinations of βR_t are stationary. Therefore, the r columns of β are cointegrating vectors, and it can be said that the vector process R_t is cointegrated with cointegrating vectors β.

An econometric model, then, can be used to test the validity of Generalized-PPP. The main hypothesis to be considered is the hypothesis of r cointegration vectors:

$$H : \pi = \alpha\beta \qquad (4.13)$$

where α and β are $n \times r$ matrices. Furthermore, in the case of $0 < r < n$, the estimation of α and β will lead to the construction of Generalized-PPP for the real exchange rates of interest to this study.

Testing for the hypothesis in (4.13) and estimating the cointegrating vectors (α and β) are accomplished by following Johansen's maximum likelihood procedure. Following this

procedure, consider (4.12) and regress both ΔR_t and R_{t-k} on $\left(\Delta R_{t-1}, \ldots, \Delta R_{t-k+1}, D_t, 1\right)$ to obtain residuals R_{0t} and R_{kt}, respectively. Letting $q_t = \left(\Delta R'_{t-1}, \ldots, \Delta R'_{t-k+1}, D'_t, 1'\right)$, then:

$$R_{0t} = \Delta R_t - \sum_{i=1}^{k-1} \hat{X}_i \Delta R_{t-i} \tag{4.14}$$

$$\text{where } \left(\hat{X}_1, \ldots, \hat{X}_{k-1}\right) = \left(\sum_{t=1}^{T} \Delta R_t q'_t\right)\left(\sum_{t=1}^{T} q_t q'_t\right)^{-1} \tag{4.15}$$

and

$$R_{kt} = R_{t-k} - \sum_{i=1}^{k-1} \tilde{X}_i \Delta R_{t-1} \tag{4.16}$$

$$\text{where } \left(\tilde{X}_1, \ldots, \tilde{X}_{k-1}\right) = \left(\sum_{t=1}^{T} R_{t-k} q'_t\right)\left(\sum_{t=1}^{T} q_t q'_t\right)^{-1} \tag{4.17}$$

The likelihood function, then, takes the form:

$$L(\alpha, \beta, \Omega) = |\Omega|^{-T/2} \exp\left\{-\frac{1}{2}\left(R_{0t} - \alpha\beta R_{kt}\right)' \Omega^{-1}\left(R_{0t} - \alpha\beta R_{kt}\right)\right\} \tag{4.18}$$

For fixed β, regress R_{0t} on $\beta' R_{kt}$ to obtain:

$$\hat{\alpha}(\beta) = -S_{0k}\beta\left(\beta' S_{kk}\beta\right)^{-1} \tag{4.19}$$

and

$$\hat{\Omega}(\beta) = S_{00} - S_{0k}\beta\left(\beta S_{kk}\beta\right)^{-1}\beta S_{k0} \tag{4.20}$$

where $S_{ij} = T^{-1}\sum_{t=1}^{T} R_{it}R_{jt}', \quad i,j = 0,k.$ (4.21)

Consequently, (4.18) can be expressed as:

$$L^{*}(\beta) = K - \frac{T}{2}\log\left|S_{00} - S_{0k}\beta\left(\beta' S_{kk}\beta\right)^{-1}\beta S_{k0}\right| \tag{4.22}$$

Maximizing (4.22) with respect to β corresponds to minimizing the generalized variance ratio:

$$\left|\beta'\left(S_{kk} - S_{k0}S_{00}^{-1}S_{0k}\right)\beta\right| / \left|\beta' S_{kk}\beta\right| \tag{4.23}$$

This minimization can now be translated into a generalized eigenvalue problem and solved:[3]

$$\left(\lambda S_{kk} - S_{k0}S_{00}^{-1}S_{0k}\right)\beta = 0 \tag{4.24}$$

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[3]From the theory of canonical correlation, an expression of the form $\left|\beta'\left(M_1 - M_2\right)\beta\right| / \left|\beta M_1 \beta\right|$ can be minimized by solving the equation $\left|\lambda M_1 - M_2\right| = 0$.

where λ is given by solving:

$$\left|\lambda S_{kk} - S_{k0}S_{00}^{-1}S_{0k}\right| = 0 \tag{4.25}$$

The complete set of eigenvectors is given, then, by solving:

$$\left(\lambda_i S_{kk} - S_{k0}S_{00}^{-1}S_{0k}\right)v_i = 0 \qquad i = 1,2, \ldots, n \tag{4.26}$$

subject to normalization:

$$V'S_{kk}V = I \tag{4.27}$$

$\hat{\beta}$ is given by the corresponding eigenvectors for r largest eigenvalues such that:

$$\hat{\beta} = \left(\hat{v}_1, \ldots, \hat{v}_r\right) \tag{4.28}$$

and $\hat{\alpha}$ and other estimate parameters are found by inserting $\hat{\beta}$ into the above equation; for example, (4.20) and (4.21).

The statistically significant cointegration vectors under the hypothesis in (4.14) can be proceeded by applying likelihood ratio tests as suggested by Johansen, such that:

$$\lambda_{trace} = -T\sum_{i=r+1}^{n}\ln\left(1-\hat{\lambda}_i\right) \tag{4.20}$$

and

$$\lambda_{\max} = -T\ln\left(1-\hat{\lambda}_{r+1}\right) \tag{4.21}$$

The distribution of λ_{trace}, or the trace statistic, is given under the hypothesis that there are r or less cointegrating vectors, against the alternative hypothesis that there are n cointegrating vectors. The $\lambda_{\max}$, or maximal eigenvalue statistic, tests the hypothesis that there are r cointegrating vectors against the alternative of $r + 1$ cointegrating vectors. Both these statistics, however, λ_{trace} and $\lambda_{\max}$, have nonstandard distributions. The distributions are multivariate versions of the Dickey-Fuller distribution. Critical values for the above statistics have been tabulated by Johansen and Juselius (1990) for values of n between 1 and 5 and by Osterwold-Lenum (1992) for values of n between 1 and 11.

The Country Groups

One of the issues raised by the theory of Generalized-PPP is that of an optimum currency area. The existence of a group of countries that constitutes a currency area depends on the degree of interrelationship among the countries in one economic community. The interrelationship itself could be considered as the effect of regionalization and economic interaction. The countries that belong to ASEAN have these characteristics.

ASEAN--Indonesia, Malaysia, the Philippines, Thailand, and Singapore--was established in August 1967. Brunei was admitted in 1984. Economic issues were not originally the first objective of ASEAN. Nevertheless, the idea of an ASEAN free trade area (ASEAN-FTA) was discussed in ASEAN ministry meetings in recent years. Finally, after many delays, the association endorsed the ASEAN-FTA development program in15 years and the Common Effective Preferential Tariff (CEPT) on selected products, proposed by Thailand, and by Indonesia, respectively, at the January 1992 summit meeting. One reason this group of countries postponed implementing the ASEAN-FTA may have been the low importance of interregional trade, despite the reality that the countries have similar exports of primary commodities and manufacturing goods. Table 4.2 provides a summary of ASEAN trade performance for 1960-90. It is clear from Table 4.2 that while the share of intraregional trade is not insignificant, it declined in the 1970s and has remained stable since then. External trade, where the United States, Japan, and Germany are the major trading partners showed a big jump in the 1970s . However, it declined slightly in the 1980s. This late external trade performance, together with increased emphasis on trade regionalization such as the North

Table 4.2. Changes in trade-to-GDP ratio: ASEAN countries (percent).

Period	Total	External Trade	Intraregional Trade
1960-70	9.4	3.6	5.8
1970-80	27.6	23.6	4.0
1980-90	23.9	19.3	4.5

Source: de la Torre and Kelley (1992).

American Free Trade Agreement and the European Economic Community, may have push the ASEAN to review the idea of an ASEAN-FTA. .

In this study, therefore, it is argued that Generalized-PPP could be valid for the ASEAN groups, the ASEAN group and each major trading partner, and the group of majortrading partners with each ASEAN country. The availability of data, however, excludes of Malaysia and Brunei from the study. Malaysia does not publish wholesale price data, and Brunei was omitted because the country did not join ASEAN until 1984. In addition, the validity of Generalized-PPP is examined for Pacific Rim countries. Thus, South Korea was added to the ASEAN group as representative of the Pacific Rim countries. There are two reasons for choosing this country. First, South Korea resembles the ASEAN members (except the Philippines in recent years) in terms of high economic growth performance and tight trade relationships with ASEAN members. Second, South Korea and the ASEAN countries are all members of Southeast Asia Central Banks (SEACEN)

Lag-Length Test

Two important assumptions in model (4.11) are independence over time and normality of disturbance terms. In this section, the choice of lag length in the VARs for all country groups is determined by applying Sims' (1980) procedure. Sims has argued that the conventional likelihood ratio test for determining lag length has some shortcomings when it is

applied to the VAR system. As an alternative, he has suggested a modified likelihood ratio test statistic such that:

$$L(T) = (T - c)\left(\ln|\Omega_R| - |\Omega_U|\right) \tag{4.22}$$

where T is the number of observations, c is the total number of regression coefficients estimated divided by the number of equations, and $|\Omega_R|$ and $|\Omega_U|$ are determinants of covariance matrices of restricted and unrestricted models, respectively. Under the null hypothesis model, the statistic $L(T)$ converges to $\chi^2(df)$, where the degree of freedom (df) is the number of linear restrictions.

For each system, the VAR model was estimated with lag lengths of 4 versus 6, 9 versus 6, and 12 versus 9, and the shortest lag length k was chosen for all equations in the system that were left with white noise residuals. Tables 4.3a, 4.3b, and 4.3c report the results of the optimal lag-length tests. For all three data series, the null hypothesis for the VAR of 6 versus 4 lag length is rejected, and the same result is obtained for the VAR of 9 versus 6 lag length.

The null hypothesis for the VAR of 12 versus 9 lag length was not completely rejected. In addition, the Durbin-Watson values for all equations in the system for all series were around 2. Based on these results and the fact that the error terms are not serially correlated, the VAR system with a lag length of 12 is used in analyzing the validity of

Table 4.3. Lag-Length Test.

a. Data Series I

Group /a	6 vs 4	9 vs 6	12 vs 9 /b
ASEAN	20.62 (0.98)	47.53 (0.72)	22.19 (1.00)
USRE-ASEAN	34.44 (0.99)	81.51 (0.99)	42.78 (0.99)
JARE-ASEAN	34.19 (0.99)	76.22 (0.93)	35.92 (1.00)
GERE-ASEAN	27.89 (0.99)	61.36 (0.99)	42.90 (1.00)
KORE-ASEAN	34.61 (0.99)	61.63 (0.99)	35.95 (1.00)
SIRE-MATRAD	27.53 (0.99)	59.57 (0.99)	53.24 (1.00)
PHRE-MATRAD	38.94 (0.99)	69.14 (0.98)	46.36 (1.00)
THRE-MATRAD	27.61 (0.99)	48.85 (0.99)	46.86 (1.00)
KORE-MATRAD	26.77 (0.99)	50.31 (0.99)	61.42 (1.00)

b. Data Series II

Group /a	6 vs 4	9 vs 6	12 vs 9 /b
ASEAN	18.84 (0.99)	45.52 (0.72)	22.70 (1.00)
USRE-ASEAN	35.11 (0.99)	27.22 (0.99)	46.62 (1.00)
JARE-ASEAN	30.26 (0.99)	83.08 (0.82)	37.68 (1.00)
GERE-ASEAN	22.52 (0.99)	71.30 (0.97)	40.23 (1.00)
KORE-ASEAN	32.21 (0.99)	69.03 (0.98)	34.93 (1.00)
SIRE-MATRAD	27.85 (0.99)	58.61 (0.99)	59.97 (1.00)
PHRE-MATRAD	39.66 (0.99)	57.39 (0.99)	65.11 (1.00)
THRE-MATRAD	26.99 (0.99)	72.38 (0.96)	61.83 (1.00)
KORE-MATRAD	26.16 (0.99)	60.54 (0.99)	79.36 (0.99)

Table 4.3. (continued)

c. Data Series III

Group /a	6 vs 4	9 vs 6	12 vs 9 /b
ASEAN	26.51 (0.87)	46.56 (0.75)	30.01 (0.99)
USRE-ASEAN	32.48 (0.99)	69.34 (0.98)	64.64 (1.00)
JARE-ASEAN	40.62 (0.99)	73.88 (0.95)	49.72 (1.00)
GERE-ASEAN	39.11 (0.99)	82.08 (0.84)	52.95 (1.00)
KORE-ASEAN	34.91 (0.99)	64.84 (0.99)	53.22 (1.00)
SIRE-MATRAD	44.96 (0.96)	65.07 (0.99)	64.11 (1.00)
PHRE-MATRAD	36.36 (0.99)	79.15 (0.89)	60.41 (1.00)
THRE-MATRAD	27.82 (0.99)	48.39 (0.99)	47.20 (1.00)
KORE-MATRAD	24.84 (0.99)	48.31 (0.99)	64.11 (1.00)

/a. The ASEAN variable consists of real exchange rates for the Philippines, Singapore, and Thailand. MATRAD consists of real exchange rates for the United States (USRE), Japan (JARE), and Germany (GERE). KORE stands for the South Korean real exchange rate. For all these real exchange rates, Indonesia is the base country.
/b Numbers are sample statistics of $L(T)$; numbers in parentheses are marginal significance levels.

Generalized-PPP for this study. The other consideration in choosing this lag length was that the data used in this study are monthly data.

Empirical Results

The validity of Generalized-PPP was investigated for the country groups using the three data series used in analyzing PPP. Besides investigating the validity of Generalized-PPP, the use of data series I, II was intended to search for any indications of the importance of oil and gas prices in Indonesia's exchange rate determination and the competitiveness of Indonesian manufactured goods excluding oil in world markets. Data series III was used in

addition to the other two series to study whether the specified real exchange rates, based on WPI and CPI, support Generalized-PPP. In this empirical investigation March 1983 is considered the point of structural break in Indonesia, as was done in the study of PPP.

For each system, the cointegration test based on the methodology discussed above was used to examine the existence of Generalized-PPP. The first attempt investigated whether the ASEAN countries constitute a currency area in the sense implied by Generalized-PPP. The second studied the influence of major trading partners on ASEAN real exchange rates.

The ASEAN Real Exchange Rate Case

Table 4.4 reports the results of the cointegraton test for real exchange rates among the ASEAN countries for all three data series. The trace test statistic rejects the null hypotheses of $r = 0$ for data series I and III and cannot reject the null hypothesis $r = 0$ for data series II at the 5 % significance level. The null hypothesis of $r \leq 1$ for series I and III cannot be rejected at 5 % significant level. These results give us the preliminary conclusion that the system has one stationary linear relationship for both series I, and III and no stationary long run linear relationship for series II.

Based on the lambda max test statistic, the null hypothesis of $r = 0$ for series III can be rejected, while for series I, and II, the null hypothesis cannot be rejected at the 5 % significance level. The null of $r = 1$ cannot be rejected for series III at the 5 % significance level. These results only support the existing of one cointegration relationship only for series III. If we compare the results of both test statistics, the results are inconsistent with respect to

the series I. Since one test statistic has supported the existence of one cointegration relationship for series I, it is concluded that the group of ASEAN real exchange rates, based on data series I and III, have a single cointegrating vector. This means that ASEAN real exchange rates based on the WPI and CPI give empirical support for the validity of Generalized-PPP.

Table 4.4 Cointegration test for the ASEAN real exchange rates.

Data	λ_{trace}			λ_{max}		
Null	$r=0$	$r\leq 1$	$r\leq 2$	$r=0$	$r=1$	$r=2$
Series I	37.209	19.713	4.819	17.495	14.896	4.817
Series II	33.263	16.700	5.049	16.562	11.651	5.049
Series III	45.102	17.226	4.074	27.876	13.151	4.074
C V /a						
5 %	34.91	19.96	9.24	22.00	15.67	9.24

/a.Critical values (CV) are based on Table 1* in Osterwald-Lenum (1992).

Another implication of these results is that the way real exchange rates are constructed affects support for the validity of Generalized-PPP. Consider the case between series I and series II. Excluding oil price from the WPI in constructing real exchange rates results in rejection of Generalized-PPP. One conjecture for this result is that oil might play a significant role in linking the ASEAN economy. As the base country in constructing the real exchange rates, Indonesia is the only major country exporting oil and gas. This could be an empirical indication that oil price has a major influence on Indonesia's exchange rate determination. As

discussed in Chapter 2, the role of oil and gas revenue on Indonesia's current account and government revenues has been very significant.

Cointegration tests for ASEAN real exchange rates based on series I and III provide empirical support for the conclusion that there exists a linear combination of ASEAN real exchange rates that is stationary. Based on this empirical support for the validity of Generalized-PPP, we constructed Generalized-PPP for the ASEAN countries. To construct and interpret the relationship of bilateral real exchange rates within this group (e.g., the relationship of the Singapore/Indonesian real exchange rate to Thailand and the Philippine real exchange rates) with respect to Indonesia, the estimated cointegration vector of β must be normalized based on the Singapore/Indonesian real exchange rate. In general, the results presented are based on the empirical study using data series I; however, some of the discussion is based on all three data series. Table 4.5 reports the long-run equilibrium relationships for ASEAN real exchange rates based on data series I.

According to the theory of Generalized-PPP, the relationship of ASEAN real exchange rates can be formed, in general, as:

$$R_{1kt} = \beta_{1l} R_{1lt} + \beta_{1m} R_{1mt} + \xi_t \qquad k,l,m = 2,3,4; \quad k \neq l \neq m \qquad (4.23)$$

where β's are long-run relationships based on cointegrating vectors as shown in Table 4.5 and ξ_t is a stationary stochastic disturbance term. If bilateral real exchange rates, which are

formed in terms of natural logarithms, are defined as the relative prices, then β can be interpreted as the long-run elasticity of demand for imports of Indonesian products.

The relationship of the Singapore/Indonesian real exchange rate to other real exchange rates in the group can be constructed following (4.23) for data series I as:

$$R_{Si} = 0.2482\ R_{Thai} + 0.2943\ R_{Phil} \qquad (4.24)$$

Equation (4.24) shows that the Singapore/Indonesian real exchange rate increases by 0.2482 percent in response to a 1 percent change in the Thailand/Indonesian real exchange rate, given that the Philippines/Indonesian real exchange rate remains constant. In other words, the Singapore/Indonesian relative price increases by 0.2482 percent as result of a 1 percent increase in Thailand's import demand for Indonesian goods. Another relationship is that a 1 percent increase in the Philippines/Indonesian relative price will cause the Singapore/Indonesian relative price to increase by 0.2943 percent. This result shows that changes in import demand for Indonesian goods in Thailand and the Philippines do not really affect Singapore/Indonesian relative prices. For other relationships in this group, however, the inverse occurs. The 1 percent change in Singapore's import demand a 4.0289 percent increase in Thailand/Indonesian relative price and a 3.3981 percent increase in the Philippines/Indonesian relative price.

Table 4.5. The long-run equilibrium relationship of ASEAN real exchange rates: Series I.

	SIRE	THRE	PHRE
SIRE		0.2482	0.2943
THRE	4.0289		-1.1856
PHRE	3.3981	-0.8434	

Interpreting α as the speed of adjustment toward the long-run equilibrium (Johansen and Juselius, 1990) allows the of study how fast each real exchange rate reacts to a deviation from Generalized-PPP in the ASEAN real exchange rate group. The values of α for all three real exchange rates are listed as:

	SIRE	THRE	PHRE
α	0.006	0.001	0.001

These results clearly show that the Singapore/Indonesian real exchange rate makes a faster adjustment than do the other two real exchange rates. The Thailand and Philippines real exchange rates have the same speed of adjustment to a deviation in Generalized-PPP. The sign of α was positive for all cases. This result signals that a deviation in Generalized-PPP could be caused by the appreciation of real exchange rates. Overall, the adjustment speeds of real exchange rates for any deviation from the long-run stationary relationship are relatively slow in this group.

The Influences of Major Trading Partners

The ASEAN countries are relatively small in comparison with their major trading partners. Therefore, it is reasonable to think that the events in large countries influence the behavior of the real exchange rates of ASEAN countries. Enders and Hurn (1991b) report that the influences of large-country events are significant to the forcing variable of real exchange rates, such as the real income processes of each Pacific Rim nation. This study examines the influence of major trading partners on ASEAN countries, but incorporates the concept of structural change in the base country (Indonesia). In addition, the study examines the behavior of each major trading partner's real exchange rate in relation to the real exchange rates for the ASEAN group. This study was motivated by the fact that the ASEAN countries, in general, have similar commodity exports to the same major trading partners.

Table 4.6 reports the cointegration test for real exchange rates for the ASEAN group and each major trading partner. Using the lambda trace test statistic for series I, we can reject the null hypotheses of $r = 0$ and $r \leq 1$ (against the alternative that $r \geq 1$ and $r \geq 2$, respectively) at the 5 percent significance level for the South Korea-ASEAN group and at 10 percent significant level for the United State-ASEAN, and Japan-ASEAN groups. The null hypotheses of $r = 0$ can be rejected, while the null hypotheses of $r = 1$ cannot be rejected at the 5 percent significance level for the United State-ASEAN, Japan-ASEAN, and Germany-ASEAN groups. The null hypothesis of $r \leq 2$ against $r \geq 2$ cannot be rejected for the South Korea-ASEAN group groups at both the 5 percent significant levels. These results suggest that there exist at least one cointegrating vectors at the 5 percent significance level in all the

groups of real exchange rates studied and at least two cointegrating vectors at the 10 percent significant level.

Lambda max test statistics, however, give inconsistent results compared with those from the lambda trace test. The null hypotheses of $r = 0$ (against the alternative that the $r = 1$) cannot be rejected at the 5 percent significance level, but the null hypothesis of $r = 0$ for the United State-ASEAN group can be rejected at the 10 percent significance level; the value of the lambda max statistic for the Japan-ASEAN group is borderline for rejecting the null hypothesis of $r = 0$ at the 10 percent significance level. According to results from both the lambda trace and the lambda max statistics, it can be concluded that there is only one cointegrating vector in both the United State-ASEAN and Japan-ASEAN groups, while for the other two groups there are no long-run stationary relationships among real exchange rates in the system.

The validity of Generalized-PPP for the same groups is also tested using data series II. This empirical study supports the results from series I. Noting that ASEAN real exchange rates have no long-run stationary relationship, it is clear that the United States and Japan as major trading partners significantly influence the ASEAN economy, while Germany and South Korea do not.

The results of the cointegrating test using data series III are slightly different. The null hypothesis of $r = 0$ (against $r \geq 1$ and $r = 1$) using lambda trace and lambda max test statistics

can be rejected at the 5 percent significance level for all groups. Both statistics, however, give inconsistent results in the case of the null hypotheses of $r \leq 1$ and $r = 1$ for the United State-ASEAN real exchange rate group. For the Japan-ASEAN and Korea-ASEAN real exchange rates, both statistics can reject the null hypothesis of $r = 0$ at 5 percent significant level. However, they consistently cannot reject the null of $r \leq 1$ and $r = 1$ at the 5 percent

Table 4.6 Cointegration test for the ASEAN group and each of the major trading partners.

Group	λ_{trace}				λ_{max}			
Null	$r = 0$	$r \leq 1$	$r \leq 2$	$r \leq 3$	$r = 0$	$r = 1$	$r = 2$	$r = 3$
Series I								
USRE-ASEAN	59.779	32.769	15.911	3.766	27.011	16.857	12.145	3.766
JARE-ASEAN	59.802	34.605	14.702	6.384	25.197	19.902	8.317	6.384
GERE-ASEAN	54.979	31.009	16.772	4.666	23.970	14.237	12.105	4.666
KORE-ASEAN	57.584	36.925	17.702	4.804	20.658	19.223	12.890	4.804
Series II								
USRE-ASEAN	58.922	33.134	14.827	3.212	25.788	18.306	11.615	3.212
JARE-ASEAN	66.764	41.540	17.239	7.662	25.224	24.301	9.577	7.662
GERE-ASEAN	53.796	34.841	18.528	4.648	19.315	15.953	13.879	4.648
KORE-ASEAN	57.032	35.164	15.884	5.074	21.867	19.281	10.809	5.074
Series III								
USRE-ASEAN	66.458	30.947	8.822	1.432	35.511	22.125	7.389	1.432
JARE-ASEAN	67.868	31.909	12.426	4.421	35.958	19.483	8.005	4.421
GERE-ASEAN	75.520	40.697	15.092	3.765	34.824	25.605	11.326	3.766
KORE-ASEAN	71.659	29.650	9.633	3.522	42.009	20.017	6.111	3.522
CV /a								
5%	53.65	34.91	19.96	9.24	28.14	22.00	15.67	9.24
10%	49.65	32.00	17.85	7.52	25.56	19.77	13.75	7.52

/a Critical values are based on Table 1^* in Osterwald-Lenum (1992).

significance level. The null of $r \leq 2$ and $r = 2$ cannot be rejected at 5 percent sugnificant level for the German-ASEAN real exchange rates.

The empirical studies of the validity of Generalized-PPP using all three data series, therefore, give mixed results for all the groups. However, the results are consistent enough to support the existence of single long-run stationary relationships among real exchange rates for the United States-ASEAN and Japan-ASEAN groups. This result leads to the conjecture that the importance of Germany and South Korea in the ASEAN economy is less than that of the United States and Japan. The dynamics of both the United States and Japanese influence on the ASEAN economy are discussed in the next chapter.

The above results above can be interpreted by forming a Generalized-PPP for both the United States-ASEAN and Japan-ASEAN groups. First, a general representation of Generalized-PPP is formed for both groups. The existence of long-run stationary relationships and the same number of countries in both groups allow Generalized-PPP to be formed as:

$$R_{1kt} = \beta_{1l} R_{1lt} + \beta_{1m} R_{1mt} + \beta_{1n} R_{1nt} + \xi_t \qquad k,l,m,n = 2,3,4,5 \qquad k \neq l \neq m \neq n \qquad (4.25)$$

where ξ is a stationary stochastic disturbance and β's are the long-run equilibrium relationships among real exchange rates within the group. As before, β's can be interpreted in terms of long-run elasticity among the relative prices.

Consider the United States as a major trading partner of all ASEAN countries, whereas the United States-ASEAN group constitutes a currency area in the Generalized-PPP sense. Assume that all the countries have similar export goods. Therefore, it is natural to think that Indonesia determines the United State/Indonesian relative price from the Indonesian perspective based on Indonesia's competitiveness among ASEAN countries. In following this argument, the long-run relationship of United State/Indonesian real exchange rates with other real exchange rates in the currency area is:

$$R_{US} = -1.2527R_{Si} + 0.8016R_{Thai} + 0.6534R_{Phil} \qquad (4.26)$$

This long-run relationship tells us that Indonesia will adjust the United State/Indonesian relative price by 0.816 percent for each 1 percent increase in the Thailand/Indonesian relative price, given that other real exchange rates remain constant. The United State/Indonesian relative price also increases by 0.6534 percent for each 1 percent increase in the Philippines/Indonesian relative price, given that other real exchanges remain constant. However, in response to a 1 percent increase in Singapore/Indonesian relative price, Indonesia decreases the United State/Indonesian relative price by 1.2527 percent. This result can be interpreted such that a 1 percent increase in Singaporean import demand for Indonesian goods causes Indonesia's competitiveness in the US market to decline by 1.2527 percent. Therefore, this result seems to suggest that Indonesia prefers the Singaporean market to the US market.

How fast each of the real exchange rates in this currency area adjust to a deviation in Generalized-PPP is an important issue in this relationship. The speed of adjustment can be judged from the following values of α:

	USRE	SIRE	THRE	PHRE
α	-0.009	-0.100	-0.008	-0.007

The speeds of adjustment for all the real exchange rates are very similar, but relatively slow. Interestingly, the adjustments move in the same direction, that is, bringing down the real exchange rate long-run relationships. In other words, the results signal that deviations in Generalized-PPP come from depreciation of all real exchange rates in this currency area.

The next step is to study the Japan/Indonesian real exchange rate long-run relationship with ASEAN group real exchange rates. Generalized-PPP for this currency area with respect to the Japanese real exchange rate is formed such that:

$$R_{Ja} = -0.4596R_{Si} - 0.0141R_{Thai} + 1.9910R_{Phi} \qquad (4.27)$$

This long-run relationship again supports the importance of the Singaporean market to the Indonesian economy. However, Indonesia seems to prefers the Japanese market over the Singaporean market. The weight of how much the Japan/Indonesian real exchange rate adjusts to a 1 percent increase in the Singapore/Indonesian real exchange rate is smaller that the weight of the United State/Indonesian real exchange rate response to the same change. Our

conjecture for explaining this result is that the Japanese market could be more stable than the US market in term of the Indonesian economy with respect to a change in Singaporean market.

The speed of adjustment of real exchange rates in this currency area to a deviation from the long-run stationary relationship, again, is expressed in values of α such that:

	JARE	SIRE	THRE	PHRE
α	-0.001	-0.006	-0.004	-0.011

It is clear from these values that the Philippines/Indonesian real exchange rate adjusts faster than do the other real exchange rates. Overall, however, all the real exchange rates adjust very slowly. One interesting finding here is that the Singapore/Indonesian real exchange rate is more sensitive than the Japan/Indonesian real exchange rate to a deviation in Generalized-PPP. This result is the same as in the case of the United State-ASEAN group. Thus, the sign of α gives an indication that deviation in Generalized-PPP is caused by the depreciation of the real exchange rates in this currency area.

The influence of large country events on the behavior of Pacific Rim nations' real exchange rates are significant (Enders and Hurn, 1991b). This study reinvestigates this issue following the Enders and Hurn (1991b) strategy, but includes structural change in the model, uses three data series, and applies the research to the ASEAN countries and South Korea.

The validity of Generalized-PPP is examined in the group of major trading partners with each ASEAN and the South Korean real exchange rates. Table 4.7 reports results of the

cointegration test for the major trading partners and each ASEAN group of real exchange rates and for the major trading partners and South Korea group of real exchange rates. First, consider the results from the use of data series I. Using lambda trace test statistics, every group's (the Philippines-, Singapore-, Thailand-, and South Korea-major trading partner) real exchange rate suggests the existence of three cointegrating vectors in each group at the 5 percent significance level. The lambda max test statistics do not support these results. Based on the lambda max statistic, all groups that included each of the ASEAN countries have only one long-run stationary relationship at the 5 percent significance level, while the South Korea/major trading partner system has two cointegrating vectors at the same significance level. Therefore, these results indicate that all groups have at least one cointegrating vector, which implies that Generalized-PPP is valid for all groups in this study. This result, then, supports the finding of Enders and Hurn (1991b).

The cointegration test results for data series II and III promote a different suggestion. Using lambda trace and lambda max test statistics, the results suggest the existence of two long-run stationary relationships for the Singapore-, Thailand-, and South Korea-major trading partner real exchange rate groups. The Philippines-major trading partner group real exchange rate has only one long-run relationship at the 5 percent significance level. This result implies that all three data series support the validity of Generalized-PPP in all groups.

For consistency, the results from data series I are presented with respect to the long-run stationary relationships of all the groups studied. The following discussion focuses on the

Table: 4.7. Cointegration test for the MATRAD group and each ASEAN and South Korean real exchange rate.

Group	λ_{trace}				λ_{max}			
Null	$r=0$	$r\leq 1$	$r\leq 2$	$r\leq 3$	$r=0$	$r=1$	$r=2$	$r=3$
Series I								
MATRAD- PHRE	60.128	37.519	18.300	4.890	22.609	19.219	13.410	4.89
MATRAD- SIRE	86.446	44.164	26.826	11.67	42.282	17.337	15.157	11.67
MATRAD- THRE	72.210	40.703	20.916	8.130	31.507	19.787	12.786	8.130
MATRAD- KORE	88.693	47.654	22.464	6.657	41.038	25.190	15.807	6.657
Series II								
MATRAD- PHRE	85.091	46.894	24.452	10.50	38.197	22.442	13.956	10.50
MATRAD- SIRE	73.973	30.899	17.018	3.625	43.073	13.881	13.393	6.626
MATRAD- THRE	85.439	47.493	18.399	5.625	37.946	29.099	13.285	5.109
MATRAD- KORE	105.19	58.276	17.580	5.199	46.906	40.696	12.381	5.199
Series III								
MATRAD- PHRE	73.538	35.395	17.883	6.182	38.143	17.512	11.700	6.182
MATRAD- SIRE	82.246	40.096	15.976	1.464	42.150	24.117	14.514	1.464
MATRAD- THRE	69.391	42.514	17.461	3.910	26.877	25.053	13.551	3.910
MATRAD- KORE	79.387	43.192	13.189	4.308	36.195	30.003	8.881	4.308
C.V /a								
5 %	53.65	34.91	19.96	9.24	28.14	22.00	15.67	9.24

/a Critical value is based on Table 1* in Osterwald-Lenum (1992)

relationship of ASEAN and South Korean real exchange rates with those of all major trading partners (the United States, Japan, and Germany). This method allows the search forhow the relative price of each ASEAN country and South Korea behave in comparison with the behavior of relative prices in the major trading partners with respect to Indonesia. For this purpose, a general representation of Generalized-PPP was constructed for all groups such that:

$$R_{1kt} = \beta_{1l} R_{1lt} + \beta_{1m} R_{1mt} + \beta_{1n} R_{1nt} + \xi_t \qquad k,\ l,\ m,\ n = 2,\ 3,\ 4,\ 5 \qquad (4.28)$$

$$k \neq l \neq m \neq n$$

where ξ is a stationary stochastic disturbance, and β's are the long-run equilibrium relationships among real exchange rates in a certain currency area in the sense of Generalized-PPP. β can also be interpreted in terms of long-run elasticity. To construct this long-run relationship, cointegrating vectors from each group must be normalized.

First, the long-run relationship of the Philippines/Indonesian real exchange rate with the real exchange rates of all major trading partners is examined with respect to Indonesia. The Generalized-PPP for this group can be formed as:

$$R_{Phi} = -1.5451 R_{US} + 2.4052 R_{Ja} - 1.3077 R_{Ge} \qquad (4.29)$$

This long-run relationship shows that a 1 percent increase in the United State/Indonesian real exchange rate causes a 1.5471 percent decline in the Philippine/Indonesian real exchange rate, given that other real exchange rates in the system are constant. A 1 percent increase in the Germany/Indonesian real exchange rate also causes a 1.3077 percent decrease in the Philippines/Indonesian real exchange rate. However, a 1 percent increase in the Japan/Indonesian real exchange rate causes a 2.4052 percent increase in the Philippines/Indonesian real exchange rate.

The speeds of adjustment from a deviation in Generalized-PPP are presented as values of α as:

	USRE	JARE	GERE	PHRE
α	- 0.008	-0.006	-0.010	-0.007

This result shows that the German and United State real exchange rates have faster rates of adjustment, but overall the speed of adjustment is relatively slow. The sign of α indicates that deviation of Generalized-PPP comes from the depreciation of real exchange rates in the group.

The Singapore/Indonesian real exchange rate relationship with the major trading partner real exchange rates gives a different representation. The long-run relationship with respect to the Singapore/Indonesian real exchange rate can be formed as:

$$R_{Si} = -0.3925R_{US} - 0.2745R_{Ja} + 0.7410R_{Ge} \qquad (4.30)$$

This equation shows that a 1 percent increase in the United State/Indonesian relative price, given other relative prices, causes a 0.3925 percent decrease in the Singapore/Indonesian relative price. The same direction of relationship occurs between Japan/Indonesian and Singapore/Indonesian relative prices. A 1 percent increase in the Japan/Indonesian relative price causes a 0.2745 percent decrease in the Singapore/Indonesian relative price. These results support our earlier findings about the behavior of the real exchange rates for each

major trading partner/Indonesia in the ASEAN real exchange rate group. The results support the conclusion that Singapore is also major trading partner for Indonesia and that Singapore's role is of almost the same importance as the US and Japanese markets are to the Indonesian economy.

The reaction of each real exchange rate to a deviation from Generalized-PPP can be judged from values of α as:

	USRE	JARE	GERE	SIRE
α	-0.005	-0.010	-0.007	-0.011

From this result, it is clear that the Singaporean and Japanese real exchange rates are more sensitive than the US and German real exchange rates to a deviation from a long-run relationship in this currency area. The result also indicates that a deviation in Generalized-PPP results from depreciation of real exchange rates in the system.

The Thailand/Indonesian real exchange rate relationship with the real exchange rate of the major trading partners can be presented as:

$$R_{Thai} = 0.3888R_{US} - 0.6723R_{Ja} + 0.9036R_{Ge} \qquad (4.31)$$

This long-run relationship shows that a 1 percent increase in United State/Indonesian competitiveness causes a 0.3888 percent increase in Thailand/Indonesian competitiveness,

given the level of other competition in the system. A 1 percent improvement in Japan/Indonesian competitiveness causes a 0.6723 percent decrease in Thailand/Indonesian relative price. This direction of relationships again are consistent with the result when the United State/Indonesian and Japan/Indonesian real exchange rates were studied against the ASEAN group real exchange rates. A 1 percent increase in Germany/Indonesian competitiveness causes an increase of 0.9036 percent in the Thailand/Indonesian relative price.

The way real exchange rates adjust to a deviation from a long-run relationship among real exchange rates within the system is explained by the value and the sign of α such that:

	USRE	JARE	GERE	THRE
α	-0.001	0.006	0.000	0.003

These speeds of adjustment tell us that the Japan/Indonesian real exchange rate is the most sensitive to a deviation in Generalized-PPP, whereas the German real exchange rate is insensitive. The sign of α indicates that a deviation in Generalized-PPP is caused by a depreciation of the US real exchange rate and by the appreciation of the Japanese, Thailand and German real exchange rates.

Lastly, the South Korea/Indonesian real exchange rate relationship with the real exchange rates of the major trading partners is presented as:

$$R_{Ko} = 0.0874R_{US} - 0.1644R_{Ja} + 0.3946R_{Ge} \qquad (4.32)$$

The result shows that the responses of the South Korean real exchange rate to a 1 percent increase in the US and Japanese real exchange rates, given that the other real exchange rates in the system are constant, are a 0.0874 percent increase and a 0.1644 percent decrease. This small change could indicate that South Korea is not a major competitor for the Indonesian market with respect to the US and Japanese markets. However, South Korea could be a competitor for the German market based on the large response in South Korea's real exchange rate to a 1 percent change Germany's real exchange rate.

Summary and Conclusions

The empirical studies applying Perron's (1989) unit root test in the presence of structural change do not support the validity of PPP for Indonesia with respect to other ASEAN countries and South Korea or to Indonesia's major trading partners such as the United States, Japan, and Germany. The null hypothesis of the unit root for all real exchange rates in which Indonesia was used as the base country cannot be rejected at the 5 per cent significance level. These results are as expected and predicted by the theory of Generalized-PPP.

Generalized-PPP was the focus of this study. Based on Johansen's (1988, 1990) maximum likelihood procedure for cointegration testing, Generalized-PPP holds in the presence of structural change for the ASEAN group; the United State-ASEAN; Japan-ASEAN; and the Philippines-, Singapore-, Thailand-, South Korea-major trading partners real

exchange rates. It follows that each of these groups of countries constitutes a currency area in the sense of Generalized-PPP. In other words, each group is one unit of the economy.

The influence of major trading partners on the economies of each of the ASEAN countries, South Korea, and the ASEAN group is significant. This result supports Enders and Hurn (1991b). To investigate how these major trading partners influence the ASEAN countries and South Korea, this study examines the dynamic interrelationships among the real exchange rates while accounting for long-run relationships and structural change. First, however, the study estimates error correction models for all real exchange rates as a short-run dynamic model.

CHAPTER 5. THE SHORT-RUN DYNAMICS OF GENERALIZED PURCHASING POWER PARITY AND INTERRELATIONSHIPS AMONG REAL EXCHANGE RATE IN A CURRENCY AREA

The cointegration test for some groups of real exchange rates --the ASEAN group, the ASEAN-and South Korea-major trading partners groups--support the validity of Generalized-PPP. The existence of cointegration vectors in the system makes it feasible to form an error correction model for the short-run dynamics of Generalized-PPP. This means that the long-run relationship will be accounted for in the estimation of Generalized-PPP in the short run. This study examines interrelationships among real exchange rates in this currency area. Typical analyses other than causality tests used for a system of equations such as VAR are impulse responses and forecasting error variance decomposition (FEVD), which measure the dynamic interactions among the variables in the system. The empirical support for a currency area in the sense of Generalized-PPP is important for this study because it lets us interpret the system as an economic system.

This chapter is organized as follows. First, the error correction model of Generalized-PPP is presented. This is followed by discussions of impulse responses and FEVD. The succeeding sections discuss the econometrics and empirical findings for this research. Finally, the summary and some conclusions are presented.

The Short-run Dynamics of Generalized Purchasing Power Parity

To study the short-run dynamics of Generalized-PPP, an error correction model is formed and estimated. The important issue in the error correction model is the inclusion of the long-run relationship in the estimated model. A dynamic model constructed with differences in nonstationary variables might be misspecified and not helpful because potentially valuable information about the relationship between the level of variables, which is likely to be related to a steady-state or long run equilibrium relationship, is lost.

One of the most important results in cointegration analysis is the Granger representation theorem (Granger, 1981; Engle and Granger, 1987). The theorem states that if a set of variables is cointegrated of order (1, 1), there exists a valid error correction representation of the data. This argument means that the validity of Generalized-PPP implies the existence of an error correction model.

The Econometric Model

The short-run dynamics of Generalized-PPP are determined by the vector error correction models. Reconsider the VAR system in (4.11) and rewrite it in the form:

$$\Delta R_t = \pi_1 \Delta R_{t-1} + \ldots + \pi_{k-1} \Delta R_{t-k} - \alpha\beta' R_{t-k} + C + \phi D_t + \varepsilon_t \qquad (5.1)$$

where all specifications for this model are the same as for (4.11). Here, β' is a matrix representing the cointegration relationship such that $\beta' R_t$ is stationary. However, the representation of model (5.1) also suggests that deviations from the equilibrium relationship $\beta' R_{t-k}$ form a stationary process. By letting $\beta' R_{t-k}$ be EC_t, we can construct our econometric model from (5.1) as:

$$\Delta R_t = \pi_1 \Delta R_{t-1} + \ldots + \pi_{k-1} \Delta R_{t-k} - \gamma EC_t + C + \phi D_t + \omega_t \qquad (5.2)$$

Model (5.2) is the vector error correction model for Generalized-PPP that will be estimated. γ measures the force of adjustment in reacting to deviations from the long-run relationship. EC_t is the error correction factor for the model. In this model, the real exchange rates in the currency area are specified such that they change over time as a function of four components: (a) deviations from the r long-run stationary relationships, (b) past change in all real exchange rates in the system, (c) a purely deterministic component, and (d) a stochastic disturbance.

Empirical Results

Three groups of vector error correction models are estimated in the present study. The groups are the ASEAN, the ASEAN and each major trading partner in which only the US and Japanese real exchange rates are considered, and the major trading partners and each ASEAN real exchange rates. Data series I was tested for this study.

The ASEAN Real Exchange Rate Cases

Table 5.1 reports the estimated error correction models for the case of the ASEAN real exchange rates. The results show that some of the parameters estimated are not significant. This result is not surprising because there are so many parameters in the system. The Durbin-Watson (D-W) values are around 2 for all the models and indicate that errors are not serially correlated.

The empirical evidence supports the importance of the error correction variables. They are all significant. The Philippine real exchange rate model shows that parameter estimates of the error correction variable has a significance level of 10 percent, whereas the significance levels of the parameter estimated for error correction variables in the other two models are almost 0 percent. In contrast, the dummy variable that represents structural change in the models is not significant. This variable has significance levels of 52 percent, 12 percent, and 27 percent for the Singapore, Thailand, and the Philippines real exchange rate models. These findings seem to weaken the case for the importance of the structural change dummy variable in the model. However, this can be considered a weak rejection because the error correction variables, which are based on the existence of structural change are all significant in all the models at the conventional level.

The adjustment of the real exchange rate to a deviation from Generalized-PPP is expressed in the parameter estimate of the error correction variables. The first equation, in which the Singaporean real exchange rate is the dependent variable, shows that approximately

Table 5.1. Error correction model: The ASEAN real exchange rate.

Model	Variable	1	2	3	4	5	6
ΔSIRE	ΔSIRE	0.0579	-0.1836	-0.1474	-0.0195	-.1433	-0.3969*
	ΔTHRE	-0.1898	0.1111	0.1463	-0.2386	0.0122*	0.2520
	ΔPHRE	-0.0200	-0.0105	-0.0226	-0.1146	-0.0185	0.0300
	C	1.0978*					
	DT	0.0033					
	EC	0.0091*					
ΔTHRE	ΔSIRE	0.0038	-0.0809	-0.0956	0.0371	-0.0447	-0.2472*
	ΔTHRE	-0.0931	0.0917	0.0978	-0.2411*	-0.1512	0.1642
	ΔPHRE	-0.1249	-0.1203	-0.1521*	0.0147	0.0302	-0.1198
	C	1.1018*					
	DT	0.0086					
	EC	0.0091*					
ΔPHRE	ΔSIRE	0.1220	-0.0732	-0.2427	-0.0459	-0.1780	-0.3464*
	ΔTHRE	0.1562	0.1837	0.0876	-0.3404*	0.0739	0.2598*
	ΔPHRE	-0.3879*	-0.1344	-0.0114	0.2439*	-0.0209	-0.12446
	C	0.6153*					
	DT	0.0072					
	EC	-0.0051*					

Note: Parameters estimated with * have less than or equal to a 10 percent marginal significance level.

7	8	9	10	11	12	SE	D-W
-0.3618*	-0.0517	-0.2586*	-0.0825	-0.3793	0.1749	0.0359	1.9854
0.2771*	0.0359*	-0.0026	-0.1346	0.1917	-0.0607		
-0.1006	-0.0876	0.1381	0.1235	0.0227	-0.0739		
-0.1965	-0.0869	-0.3035	-0.0859	-0.2629	0.1012	0.0367	1.9906
0.1086	0.1007	0.0521	-0.0600	0.1911	0.0864		
-0.1649	-0.1588	0.0435	0.0357	-0.0200	-0.1830		
0.0211	-0.1962	-0.2102	-0.1055	-0.2346	0.0582	0.0447	2.0067
0.1641	0.1792	-0.0109	-0.0264	0.1675	0.0629		
-0.3206*	-0.0250	0.2205*	0.1025	0.0293	-0.0627		

1 percent of the deviation from long-run stationary equilibrium was adjusted within one month. The same result was found for the Thailand real exchange rate model, whereas the slowest adjustment was performed by the Philippines real exchange rate model. In addition, the direction of the adjustments brings real exchange rates up. In other words, deviations from Generalized-PPP in the short run for this group are caused by appreciation of real exchange rates in the system. Based on the value of the standard errors of the dependent variables, the Singaporean real exchange rate is the most stable in the system. The Thailand real exchange rate is more stable than the Philippine real exchange rate.

The ASEAN and each Major Trading Partner Real Exchage Rate Cases

As mentioned, only the United State-ASEAN and Japan-ASEAN real exchange rate groups support Generalized PPP is to hold. Table 5.2 reports the empirical results of the error correction models with parameter estimates for the US, Japanese and Singaporean real exchange rate models.

First, the research considers the US-ASEAN group. Again, some of the parameter estimates are not significant. However, the error correction and dummy variables have almost 0 percent significance levels for both the US and Singaporean real exchange rate models. These findings support the importance of the structural change dummy and error correction variables in the models. The D-W values, which are around 2.0 for both models, indicate that errors in the models are not serially correlated. In addition, the standard errors of the

Table 5.2. Error correction model: Major trading partner and ASEAN real exchange Rates.

Model	Variable	1	2	3	4	5	6
ΔUSRE	ΔUSRE	-0.3707*	-0.1192	-0.1449	-0.0908	0.0850	-0.2329
	ΔSIRE	0.0982	-0.1535	-0.1495	0.0014	-0.1613	-0.2248*
	ΔTHRE	0.1024	0.1723	0.1387	-0.1377	-0.0112	0.2832*
	ΔPHRE	-0.0222	-0.0352	-0.0244	0.0268	-0.1087	-0.0248
	C	1.9024*					
	DT	0.0319*					
	EC	0.0097*					
ΔSIRE	ΔUSRE	-0.4807	-0.2798	-0.2353	-0.0916	0.0944	-0.2866
	ΔSIRE	0.1492	-0.2081	-0.1417	-0.0426	-0.2223*	-0.3289*
	ΔTHRE	0.0196	0.3210*	0.2431	-0.1715	-0.0226	0.4292
	ΔPHRE	0.1022	0.0216	0.0607	0.1479	-0.0346	0.0267
	C	2.0754*					
	DT	0.0313*					
	EC	0.0106*					
ΔJARE	ΔJARE	-0.0013	-0.0196	0.1519	0.1694	0.2628*	-0.1115
	ΔSIRE	-0.0796	-0.0573	-0.1080	-0.0516	-0.0052	-0.1525
	ΔTHRE	-0.0170	0.2117	-0.0526	-0.3694*	-0.1209	0.3496*
	ΔPHRE	-0.1172	-0.1890*	-0.0716	0.0153	-0.2442*	-0.1368
	C	0.0239					
	DT	0.0148					
	EC	0.0005					
ΔSIRE	ΔJARE	0.0790	-0.0409	0.1297	0.1289	0.1415	0.0297
	ΔSIRE	0.1010	-0.0609	-0.0684	0.0430	-0.1048	-0.2153
	ΔTHRE	-0.1615	0.1588	0.0888	-0.2895*	-0.0329	0.1620
	ΔPHRE	-0.1154	-0.1065	-0.1293	0.0245	-0.1031	-0.0597
	C	0.2681*					
	DT	0.0276*					
	EC	0.0054*					

Note: Parameters estimated with * have less than or equal to a 10 percent marginal significance level.

7	8	9	10	11	12	SE	D-W
0.0995	-0.1491	0.0928	-0.0596	-0.0647	0.1219	0.0338	1.9611
-0.2874*	-0.1687	-0.3821*	-0.2107	-0.3361	0.0395		
0.0575	0.2389	-0.0041	0.0570	0.1976	-0.0533		
-0.1207*	-0.1121	0.0958	0.0861	0.0633*	-0.0707		
0.3005	-0.0842	-0.0174	0.0253	-0.3354	0.1098	0.0359	1.9482
-0.4345*	-0.1179	-0.3115*	-0.2039	-0.3769*	0.1435		
0.1341	0.0950	0.0315	-0.1306	0.4040	-0.1625		
-0.1783	-0.0434	0.1218	0.1586	0.0819	-0.0310		
-0.0219	0.2367*	0.0471	0.0001	0.0728	0.2175	0.0410	1.9728
-0.0538	-0.0769	-0.1838	0.0107	-0.1521	-0.0353		
0.1827	-0.1511	-0.1430	-0.2072	0.0434	-0.1521		
-0.2535	-0.0921	0.1412	0.1078	-0.0962	-0.1005		
-0.0359	0.1716	-0.0225	0.0603	0.1007	0.0975	0.0359	1.9796
-0.1652	0.0515	-0.0179	0.1126	-0.2009	0.0516		
0.2052	-.0742	-0.0802	-0.2864*	0.0289	-0.1383		
-0.2046*	-0.2038	0.0242	0.0346	-0.0859	0.0017		

dependent variable in the US real exchange rate model are smaller than those of the Singaporean real exchange rate model. This finding provides evidence that the US real exchange rate is more stable than the Singaporean real exchange rate.

The US and Singaporean real exchange rates are relatively slow to adjust to a deviation from the long-run relationship in the short run. The US real exchange rate adjusts by about 1 percent within one month of a deviation from the long-run stationary equilibrium. The speed of adjustment by the Singaporean real exchange rate is slightly faster, but is not greatly different from the US real exchange rate adjustment. Both real exchange rates adjusted in the same direction, pulling the real exchange rate up.

The estimation of the Japan-ASEAN real exchange rate model gives interesting results. The Singaporean real exchange rate model is more stable than the Japanese real exchange rate model. If we compare this result to previous findings, we might conclude that the US/Indonesian real exchange rate model is the most stable in the systems. The implication of this finding could be related to how Indonesia has dealt with stabilization policy. Thus, it might be more appropriate for Indonesia to target the United State/Indonesian relative price than the Japan/Indonesian relative price.

In addition to the above results, the data do not support the importance of the error correction variable or the structural change dummy variable in the Japanese real exchange rate model. The parameter estimate for the dummy variable has a significance level of 28 percent, while the error correction variable shows an 84 percent significance level. In contrast, the Singaporean real exchange rate gives a convincing result with respect to both of these

variables. The parameter estimate of the dummy and error correction variables have 3 percent and 4 percent significance levels, respectively. In addition, the D-W values for both models are around 2. This finding suggests that the Singaporean real exchange rate model could be the appropriate model for this system.

The Major Trading Partners and each ASEAN Real Exchange Rate Cases

We study the short-run dynamics of Generalized-PPP for the case involving the group of major trading partners with each ASEAN and the South Korean real exchange rates. Because all these groups support the validity of Generalized-PPP, the existence of error correction is ensured in the models. This discussion, however, focuses on the effects of the major trading partner real exchange rates on each ASEAN country's real exchange rate. Specifically, the following discussion considers how ASEAN/Indonesian relative prices rely on major trading partner/Indonesian relative prices. This is the reverse of the previous section, which investigated how United State/Indonesian and Japan/Indonesian relative prices were influenced by ASEAN/Indonesian relative prices. This study is reasonable if we recall how Indonesia determines relative prices with respect to the United States and Japan, with ASEAN countries as competitors. Table 5.3 reports the error correction models with the parameter estimates.

We first consider the group of major trading partners and Singaporean real exchange rates. Of interest in this case is the study of the short-run dynamics of Generalized-PPP with respect to the Singaporean real exchange rate. The importance of the structural change

Table 5.3. Error correction model: Major trading partner and each ASEAN or South Korea real exchange rate.

Model	Variable	1	2	3	4	5	6
ΔSIRE	ΔUSRE	-0.1533	0.1171	0.1315	0.0636	0.2691*	0.1649
	ΔJARE	-0.0616	-0.2283*	0.0012	0.0523	0.0588	-0.0147
	ΔGERE	0.1408	0.2586*	0.0501	-0.0948	0.0243	0.0169
	ΔSIRE	-0.1158	-0.3291*	-0.2365	-0.1731*	-0.4701*	-0.3359*
	C	1.2794*					
	DT	0.0505*					
	EC	0.0118*					
ΔTHRE	ΔUSRE	-0.3312*	-0.1453	0.0349	0.1919	-0.0505	-0.1612
	ΔJARE	-0.0650	-0.0119	-0.0603	0.2022*	0.2765*	0.0846
	ΔGERE	0.1836	0.0567*	0.1154	-0.0856	-0.0999	-0.0058
	ΔTHRE	0.0214	0.0319	-0.1537	-0.4239*	-0.1666	0.01987
	C	-0.3535					
	DT	0.0115					
	EC	0.0034					
ΔPHRE	ΔUSRE	0.2448	-0.0794	-0.1138	-0.2276	-0.0205	-0.0788
	ΔJARE	-0.1456	-0.0173	-0.1304	0.1146	0.1605	0.1135
	ΔGERE	0.1519	0.1400	0.2351*	-0.2320*	-0.1113	-0.0906
	ΔTHRE	-0.4181*	-0.2123*	-0.1494	0.1179	-0.1131	-0.1887
	C	0.4231					
	DT	0.0142*					
	EC	0.0022					
ΔKORE	ΔUSRE	0.0996	0.0354	0.1337	-0.0440	0.0923	0.1044
	ΔJARE	-0.1610	0.1742	0.0431	0.1505	0.2625*	-0.0167
	ΔGERE	0.2444*	-0.1148	0.1001	-0.1375	-0.1159	0.0723
	ΔKORE	-0.2859*	-0.1804	-0.3790	-0.1356	-0.2902*	-0.2019
	C	-0.3869*					
	DT	0.0029					
	EC	0.0047*					

Note: Parameters estimated with * have less thanor equal to a10 percent marginal significance level.

7	8	9	10	11	12	SE	D-W
0.4425*	-0.0593	0.1906	0.0014	0.1231	0.0954	0.0359	1.8973
-0.1739	0.0389	-0.3471*	-0.2281*	-0.1369	0.1219		
0.1789*	0.0102	0.2455*	0.0814	0.2442*	-0.2482*		
-0.6644*	-0.1512	-0.2812*	-0.0427	-0.4559*	0.0237		
0.1056	-0.0437	0.0689	0.1080	-0.0610	-0.0661	0.0367	1.9843
-0.1197	0.2555*	-0.0848	-0.1007	-0.1321	0.1146		
0.1930*	-0.0374	0.0653	0.1411	0.1783	-0.0651		
-0.2988*	-0.2099	-0.1079	-0.2104	-0.0323	0.0210		
0.2164	-0.1692	-0.0779	-0.1566	-0.1981	-0.1737	0.0448	1.9984
0.2537*	0.5037*	0.0506	0.2608*	0.0159	0.1355		
-0.1973*	-0.1707	0.0040	-0.2139*	0.0701	0.03746		
-0.4062	-0.1631	0.0359	0.0849	0.0939	0.0263		
-0.1103	-0.0673	-0.0390	-0.0088	0.0870	-0.1245	0.0370	1.9989
-0.0221	0.3316*	-0.1099	0.1262	0.0031	0.0923		
0.0007	-0.0650	0.1333	-0.0958	0.0757	0.0189		
-0.0284	-0.2145	0.0197	-0.0557	-0.1820	0.0744		

dummy and error correction variables is supported by the empirical results. The parameter estimates of both the dummy and error correction variables have almost 0 percent significance levels. The parameter estimate for the error correction variable shows that the Singaporean real exchange rate adjusts by 1.2 percent after one month to a deviation from long run equilibrium caused by the appreciation of real exchange rates in the system. The model is less stable compared with the US real exchange rate model. However, the Singaporean model is slightly more stable than the other two models in the system.

The study of the group of major trading partners and the Philippines real exchange rates gives different results. The importance of the structural change dummy variable is supported by the data; however, the findings show weak support for the error correction variable, which has a 15 percent significance level. This model is less stable than the Singaporean real exchange rate model. The Thailand real exchange rate model constructed to study the major trading partner and Thailand real exchange rates did not support the existence of the structural change dummy and error correction variables. The significance levels for the variables were 16 percent and 20 percent, respectively. The Thailand real exchange rate model is shown to be less stable than the Singaporean real exchange rate model.

Lastly, the above result are compared with results from a study of the major trading partner and South Korean real exchange rates. In this case, the existence of the error correction variable can not be rejected at the 9 percent significance level, and the importance of the structural change dummy variable is not supported by the data. In addition, the South Korean real exchange rate model is less stable than the Singaporean real exchange rate model.

The adjustment parameters estimated for the Philippines, and Thailand real exchange rates for a deviation from Generalized-PPP are very low. In addition, the Thailand real exchange rate adjustment seems to bring the real exchange rate down in response to the depreciation of real exchange rate. The Philippines real exhange rate, however, has the same direction of adjustment as the Singaporean real exchange rate and moves to push the real exchange rate up.

The adjustment of the South Korean real exchange rate in response to a deviation from Generalized-PPP is also very slow. However, it moves in the same direction as the Philippine and Singaporean real exchange rate adjustments. These results suggest that the Singapore/Indonesian, Philippines/Indonesian, and South Korea/Indonesian real exchange rates tend to appreciate in the United State/Indonesia, Japan/Indonesia, and Germany/Indonesia group. This result indicates that Indonesia tends to make export goods more competitively for the US and Japanese market than do the other ASEAN markets, and the South Korea market, but the reverse is true for the Thailand market.

The Interrelationships among Real Exchange Rates in the Currency Area

The validity of Generalized-PPP for some groups of countries leads to the question of how the real exchange rates in the system are interrelated. Common methods of investigating the interrelationships among variables in a dynamic model are impulse response and (FEVD). In this study, impulse responses can show how one real exchange rate responds over time to a

surprise movement (shock) in itself and/or in other real exchange rates in the system. FEVD shows the amount of forecasting error the model allows in response to surprise movements in each real exchange rate in the system. In other words, the degree of exogeneity to a set of bilateral real exchange rates can be estimated by calculating the percentage of the *h*-period-ahead forecast error variance of one real exchange rate produced by an innovation in another real exchange rate.

This method of studying dynamic interaction among variables in one system was first introduced by Sims (1980). Related to the issue of long-run stationary relationships, Lutkepholl and Reimers (1992) argued the importance of impulse responses and FEVD analysis of cointegrated systems. This method is appropriate for analyzing interrelationships among real exchange rates in a system in which Generalized-PPP holds.

The background for impulse responses and FEVD analysis is discussed in the next sections, followed by a discussion of the results.

Impulse Response Analysis of a Cointegrated System

Let's reconsider the VAR model (4.10). For simplicity, the model can be rewritten such that:[1]

$$R_t = \pi_1 R_{t-1} + \ldots + \pi_{k-1} R_{t-k-1} + \pi_k R_{t-k} + \varepsilon_t \qquad (5.3)$$

[1] For more discussion about impulse response and forecast error variance decomposition see Lutkepohl (1993).

where ε_t is an independently identically normally distributed n-dimensional vector with zero mean and covariance matrix Ω. Assume that $\Delta R_t = R_t - R_{t-1}$ is stationary, and that:

$$\det\left(I_n - \pi_1 z - \ldots - \pi_k z^k\right) \tag{5.4}$$

has all its roots outside the complex unit circle except for the possibility that some roots are unity. This assumption implies that:

$$\pi = -\left(I_n - \pi_1 - \ldots - \pi_k\right) \tag{5.5}$$

may be singular, that is to say of rank $r \leq n$.

Now assume that $r < n$. This assumption implies that model (5.3) represents a cointegrating system. To relate impulse responses to this cointegrating system, consider the VAR system (5.3). First, the model must be constructed in such a way that the residual of this model is uncorrelated. For this purpose, decompose the white noise covariance matrix Ω_ε such that $\Omega_\varepsilon = W\Lambda W'$, where Λ is a diagonal matrix with positive diagonal elements and W is a lower triangular matrix with a unit diagonal. This decomposition is obtained from the Choleski decomposition of $\Omega_\varepsilon = PP'$ by having a diagonal matrix D which has the same diagonal as P and defining $W = PD^{-1}$ and $\Lambda = DD'$.

Pre-multiplying (5.3) by W^{-1} gives:

$$W^{-1}R_t = A_1R_{t-1} + \ \ldots\ + A_kR_{t-k} + \vartheta_t \tag{5.6}$$

where $A_i = W^{-1}\pi_i$, $i = 1, \ldots, k$ and $\vartheta_t = (\vartheta_{1t}, \ldots, \vartheta_{nt}) := W^{-1}\varepsilon_t$ has diagonal covariance matrix $\Omega_\vartheta = E(\vartheta_t\vartheta_t') = W^{-1}E(\varepsilon_t\varepsilon_t')(W^{-1})' = \Lambda$. Adding $(I_n - W^{-1})R_t$ to both sides of (5.6) gives

$$R_t = A_0R_t + A_1R_{t-1} + \ \ldots\ + A_kR_{t-k} + \vartheta_t \tag{5.7}$$

where $A_0 = I_n - W^{-1}$. Because W is a lower triangular matrix with a unit diagonal, the same is true for W^{-1}; then:

$$A_0 = \begin{bmatrix} 0 & 0 & . & 0 & 0 \\ \alpha_{21} & 0 & . & 0 & 0 \\ . & . & . & . & . \\ . & . & . & . & . \\ \alpha_{n1} & \alpha_{n2} & . & \alpha_{n,n-1} & \end{bmatrix}$$

is a lower triangular matrix with zero diagonal. To get impulse response θ_i, we solve system (5.7) for R_t such that:

$$R_t = (I_n - A_0)^{-1}A_1R_{t-1} + \ \ldots\ + (I_n - A_0)^{-1}A_kR_{t-k} + (I_n - A_0)^{-1}\vartheta_t \tag{5.8}$$

Note that $\left(I_n - A_0\right)^{-1} = W = PD^{-1}$. This finding shows that the instantaneous effect of one standard deviation shock (ϑ_{it} of size one standard deviation) to the system is represented by the elements of $WD = P = \theta$ because the diagonal elements of D are the standard deviations of the components of ϑ_{it}. Then θ_i can be found by tracing these effects through the system.

Forecast Error Variance Decomposition Analysis

Consider impulse responses that are performed in terms of a moving average representation such that:

$$R_t = \varepsilon_t + \sum_{i=0}^{\infty} \phi_i P P^{-1} \varepsilon_{t-1} \tag{5.9a}$$

and

$$R_t = \varepsilon_t + \sum_{i=0}^{\infty} \Theta_i \omega_{t-1} \tag{5.9b}$$

where the components of $\omega_t = \left(\omega_{1t}, \ldots, \omega_{n1}\right)$ are uncorrelated and have unit variance $\Omega_\omega = I_n = P^{-1}\Omega_\varepsilon\left(P^{-1}\right)'$, $\Theta_i = \phi_i P$, and $\omega_{t-1} = P^{-1}\varepsilon_{t-1}$.

The optimal h-step forecast error for this moving average, then, is:

$$R_{t-h} - R_t(h) = \sum_{i=0}^{h-1} \phi_i \varepsilon_{t+h-1} = \sum_{i=0}^{h-1} \phi_i P P^{-1} \varepsilon_{t+h-1}$$

$$= \sum_{i=0}^{h-1} \Theta_i \omega_{t+h-i} \tag{5.10}$$

Let the mn-element of Θ_i be $\theta_{mn,i}$, then the h-step forecast error of the j^{th} component of R_t is

$$R_{j,t+h} - R_{j,t}(h) = \sum_{i=0}^{h-1} \left(\theta_{j1,i} \omega_{1,t+h-i} + \ldots + \theta_{jk,i} \omega_{k,t+h-i} \right)$$

$$= \sum_{l=1}^{h-1} \left(\theta_{jl,0} \omega_{l,t+h} + \ldots + \theta_{jl,h-1} \omega_{l,t+i} \right) \tag{5.11}$$

Therefore, the forecast error of the j^{th} component potentially consists of innovations of all other components of R_t as well. Noting that $\omega_{n,t}$ are uncorrelated and have variance one, then the mean square error (MSE) of $R_{j,t}(h)$ is:

$$E\left(R_{j,t+h} - R_{j,t}(h) \right)^2 = \sum_{l=1}^{n} \left(\theta_{jl,0}^2 + \ldots + \theta_{jl,h-1}^2 \right).$$

Hence,

$$\theta_{jl,0}^2 + \ldots + \theta_{jl,h-1}^2 = \sum_{i=0}^{h-1} \left(e_j' \Theta e_l \right)^2 \tag{5.12}$$

This equation can be interpreted as the contribution in variable l to the forecast error variance or MSE of the h-step forecast of variable j. e_l is the l^{th} column of I_n. The forecast error variance components are then calculated by dividing (5.12) by $MSE\left(R_{j,t}(h)\right) = \sum_{i=0}^{h-1}\sum_{l=1}^{n}\theta_{jk,i}^2$, that is:

$$\omega_{jl,h} = \sum_{i=0}^{h-1}\left(e_j \Theta e_k\right)^2 / MSE\left(R_{j,t}(h)\right) \tag{5.13}$$

which is the proportion of the h-step forecast error variance of variable j that accounts for innovations in variable k. The way the forecast error variance is decomposed into components is accounted for by innovations in the different variables, or real exchange rates, of the currency area.

Empirical Results

Econometric model (5.2) is the model estimated in this study. The order of variables in estimating FEVD and impulse responses is crucial. This relates to the orthogonalization of the error term. By placing one variable in the first place, the assumption is made that this variable is exogenous to the system. On the other hand, the last variables in the system become dependent on all the variables, so that it does not have an influence on the other variables by construction.

In this study, the innovations in major trading partner real exchange rates are assumed to enter the smaller-country real exchange rate equations. This means that a major trading partner's real exchange rate innovation influences a smaller country's real exchange rate, but the smaller country's real exchange rate innovation affects only its own real exchange rate. In the case where the United States, Japan, and Germany are all in the system, all possible orders are estimated. The order of the US and Japanese real exchange rates suggest similar results, as does the order where the German real exchange rate is in first place. In the following discussion, we present only the results from the order of the US and Japanese real exchange rates. The FEVD results are presented, followed a discussion about the by impulse responses. The study uses only data series I for the country group of interest.

The ASEAN Real Exchange Rate Case

Forecasting Error Variance Decomposition Table 5.4 presents the variance decomposition of the real exchange rates for all ASEAN countries. The Singaporean real exchange rate explains most of its own forecast error variance. The Philippine real exchange rate also accounts for most of its own forecast error variance, but is not as strong as the Singaporean real exchange rate. The Singaporean real exchange rate account for 93.93 percent, 86.80 percent, 84.15 percent, and 83.06 percent whereas the Philippines real exchange rate accounts for55.49 percent, 55.50 percent, 54.66 percent, and 54.37 percent of its own forecast error variance at 6, 12, 18, and 24 months, respectively. On the other hand,

Table 5.4. Forecast error variance decomposition of ASEAN real exchange rates.

Forecast error in	Forecast horizon *h*	Standard error	Proportions of forecast error variance *h* periods ahead accounted for by innovations in		
			ΔSIRE	ΔTHRE	ΔPHRE
ΔSIRE	2	0.0317	98.33	1.64	0 .03
	3	0.0319	97.69	2.24	0.07
	4	0.0321	96.75	3.16	0.09
	6	0.0329	93.93	4.62	1.45
	12	0.0352	86.80	10.25	2.95
	18	0.0365	84.15	12.47	3.48
	24	0.0369	83.06	13.23	3.71
ΔTHRE	2	0.0333	60.19	38.64	1.17
	3	0.0335	60.19	38.38	1.43
	4	0.0339	60.20	37.54	2.26
	6	0.0346	58.93	38.61	2.46
	12	0.0359	56.58	37.14	4.28
	18	0.0372	56.97	35.99	7.07
	24	0.0376	56.65	36.11	7.24
ΔPHRE	2	0.0412	39.35	4.06	56.59
	3	0.0412	39.37	4.22	56.41
	4	0.0417	40.67	4.21	55.12
	6	0.0427	39.16	5.35	55.49
	12	0.0444	38.67	5.83	55.50
	18	0.0450	38.98	6.36	54.66
	24	0.0451	38.93	6.70	54.37

the Thailand real exchange rate explains only about 40 percent of its own forecast error variance. The results suggest that the movement in the Singaporean real exchange rate is explained strongly by its own past innovations. These results are supported by the findings from FEVD when the orders start with the Thailand and Philippine real exchange rates,

respectively. The results of FEVD show that variance decomposition of the Singaporean real exchange rate to a shock in itself appears to increase over time. Therefore, the Singaporean real exchange rate appears to be exogenous in the system.

An innovation in the Singapore real exchange rate accounts for about 60 percent and 40 percent of the forecast error variance in the Thailand and Philippines real exchange rates, respectively. The Thailand real exchange rate explains only 13.23 percent and 6.70 percent of the forecast error variance in the Singaporean and the Philippines real exchange rates. Furthermore, the Philippines real exchange rate influence seems very low for both Singaporean and Thailand real exchange rate innovations. A shock in the Philippines real exchange rate only accounts for about 3.71 percent of the Singaporean and 7.24 percent of the Thailand real exchange rate forecast error variances. In contrast, the Singaporean real exchange rate shows strong feedback in reaction to shocks in the Thailand and Philippine real exchange rates. Thailand and Philippine feedbacks to a shock in the Singaporean real exchange rate are relatively low. This result indicates that the Singaporean real exchange rate is the leading variable in the system.

Impulse Response Function From the study discussed above, the Singaporean real exchange rate was found to have a strong influence on other real exchange rates in the system as well as on its own movements. This result motivated the focus of the present study on investigating the effects of a typical shock in the Singaporean real exchange rate on the

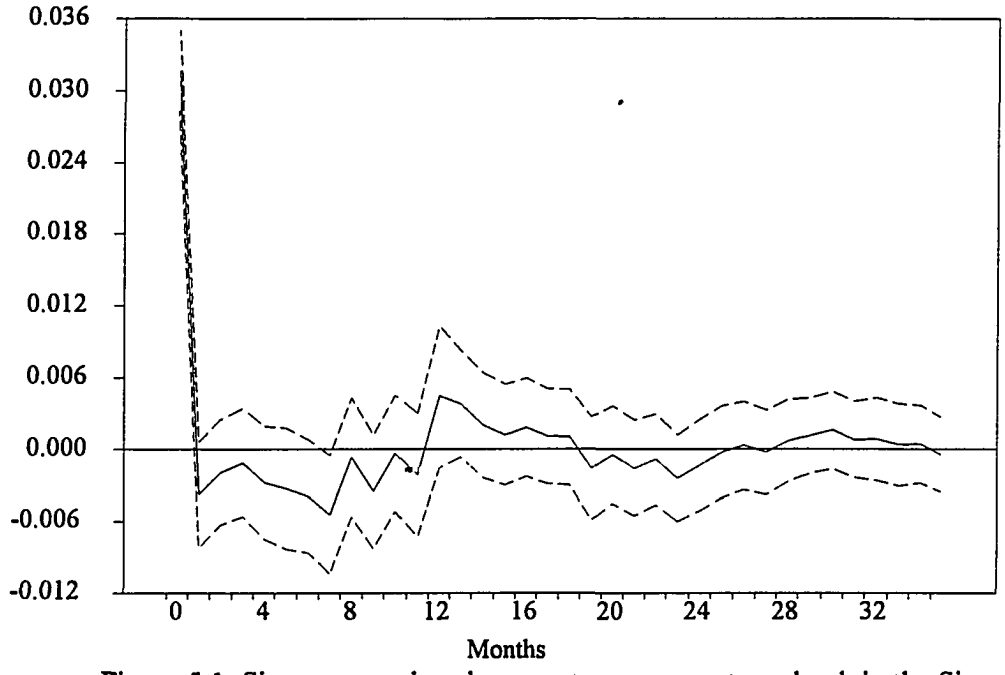

Figure 5.1. Singapore real exchange rate responses to a shock in the Singaporean real exchange rate.

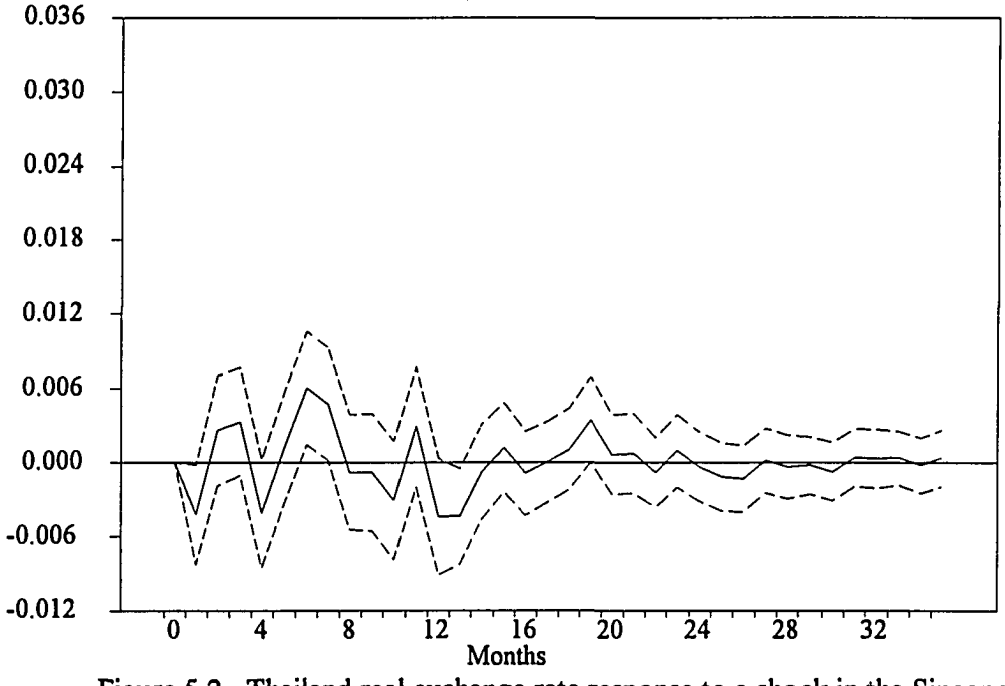

Figure 5.2. Thailand real exchange rate response to a shock in the Singaporean real exchange rate.

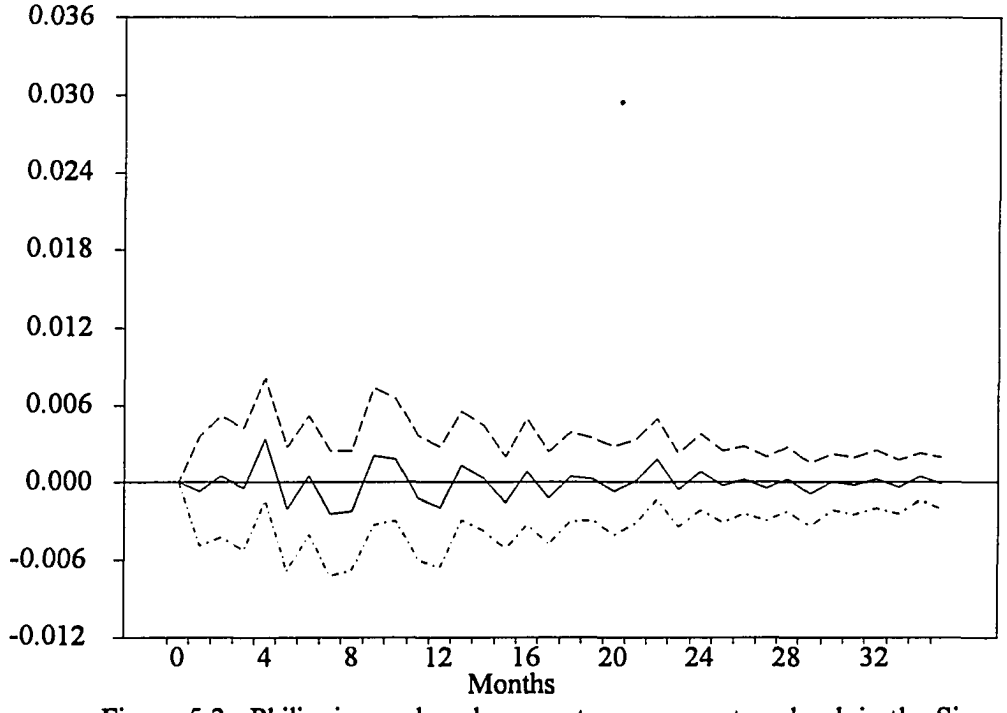

Figure 5.3. Philippine real exchange rate responses to ashock in the Singaporean real exchange rate.

Thailand and Philippine real exchange rates and on itself. The impulse response functions for the Singaporean, Thailand and the Philippines real exchange rates with respect to a shock in the Singaporean real exchange rate are displayed in Figures 5.1 through 5.3. The estimated two standard error bounds are depicted as dashed lines.

Figure 5.1 plots responses of the Singaporean real exchange rate to a typical shock in itself. For the first 12 months, impulse responses fluctuated below the original level and continue to cycle after a six-month period from positive to negative. However, the overall response is quite stable. The impulse seems to reach its long-term position in the sense that it

remains almost constant if no further shocks hit the system after 26 months from the original shock. The effects of the shock do not have a permanent effect on the real exchange rate.

The plot of the Thailand real exchange rate response to a typical shock in the Singaporean real exchange rate is presented in Figure 5.2. It is clear that the shock does not have a permanent effect on the Thailand real exchange rate. The impulse, however, fluctuates within a relatively wider range in the first year and becomes more stable after 20 months. The response approximately reaches its long-term position after 28 months from the initial shock. The shock clearly has a transitory effect.

Figure 5.3 shows that the effect of a shock in the Singaporean real exchange rate on the Philippines real exchange rate is very weak. The effect is also not permanent, but it continues for about 18 months after the initial shock. The results seem to suggest that Singapore/Indonesian relative prices do not have a significant influence on Philippines/Indonesian relative prices. This could imply that bilateral trading between Indonesia and Singapore is independent from bilateral trading between Indonesia and the Philippines.

The ASEAN and Each Major Trading Partner Real Exchange Rate Cases

There are two cases of interest in the present study. The first is the group of United State-ASEAN real exchange rates, and the second is the group of Japan-ASEAN real exchange rates. FEVD and impulse responses are examined for both cases.

The United State-ASEAN Real Exchange Rate Case

Forecast Error Variance Decomposition Table 5.5 reports FEVD for this group. It is clear from these results that the US real exchange rate accounts for most of its own forecast error variance. After 24 months, it still explains 80 percent of its own forecast error variance. The Singaporean , Thailand, and the Philippines real exchange rates explain only 34 percent, 21 percent, and 39 percent their own forecast error variance after 24 months, respectively.

The response of the US real exchange rate to a shock in other real exchange rates is also strong. The feedback responses of the US real exchange rate in reaction to the shock in the Singaporean, Thailand and Philippines real exchange rates are about 49 percent, 66 percent, and 44 percent, respectively, after 24 months, whereas feedback responses of the Singaporean, Thailand and Philippine real exchange rates to a shock in the US real exchange rate are 10 percent, 5 percent and 4 percent for the same period. These empirical findings suggest that the US real exchange rate is exogenous to the system.

From the long-run relationship of this group, the US real exchange rate has an inverse relationship with the Singaporean real exchange rate. This result leads to a study of FEVD with the order Singapore, the United States, Thailand, the Philippines real exchange rates. The behavior of the Thailand and the Philippines real exchange rates with respect to the other two real exchange rates are similar. The results with respect to the US and Singaporean relationship are interesting. US real exchange rate feedback to a shock in the Singaporean real exchange rate is 14 percent, compared to a 10 percent Singaporean feedbacks in response

Table 5.5. Forecast error variance decomposition of the US and ASEAN real exchange rates.

Forecast error in	Forecast horizon *h*	Standard error	Proportions of forecast error variance *h* periods ahead accounted for by innovations in			
			ΔUSRE	ΔSIRE	ΔTHRE	ΔPHRE
ΔUSRE	2	0.0301	99.28	4.42	0.26	0.03
	3	0.0304	98.12	1.05	0.78	0.04
	4	0.0307	97.21	1.49	1.18	0.11
	6	0.0314	94.96	1.99	1.98	1.06
	12	0.0329	87.79	4.72	4.58	2.91
	18	0.0343	81.63	8.75	5.37	4.25
	24	0.0349	79.11	10.25	6.11	4.53
ΔSIRE	2	0.0306	67.65	31.69	0.00	0.66
	3	0.0310	66.04	31.55	1.76	0.65
	4	0.0313	64.91	31.21	3.20	0.68
	6	0.0320	62.88	31.02	4.28	1.81
	12	0.0345	55.17	32.15	8.61	4.07
	18	0.0364	50.02	34.27	9.94	5.77
	24	0.0370	48.89	34.56	10.15	6.40
ΔTHRE	2	0.0332	79.07	1.20	19.65	0.07
	3	0.0336	77.96	1.45	20.07	0.52
	4	0.0339	77.72	1.48	20.07	0.72
	6	0.0345	76.74	1.50	20.91	0.85
	12	0.0357	72.91	3.15	21.58	2.35
	18	0.0370	68.03	6.17	20.50	5.30
	24	0.0375	66.46	7.15	20.69	5.69
ΔPHRE	2	0.0386	55.09	0.39	0.54	43.98
	3	0.0390	54.14	0.43	2.15	43.27
	4	0.0396	53.19	2.53	2.18	42.10
	6	0.0404	51.68	3.29	3.05	41.97
	12	0.0436	46.43	4.05	8.95	40.56
	18	0.0446	44.78	6.09	9.35	39.77
	24	0.0449	44.56	6.54	9.42	39.47

to a US shock. The US real exchange rate accounts for 32 percent of its own forecast error variance, compared with 35 percent for the Singaporean real exchange rate after 24 months in the previous order. Another difference is that Singapore response to its own shock increases, whereas the US response to its own shock decreases over time. These findings suggest that the US and Singaporean real exchange rates could be exogenous to the system. However, because the United States is a major trading partner for Singapore and Indonesia, it can be argued that the US real exchange rate is a leading variable in the system.

Impulse response function The impulse response functions for the United State-ASEAN real exchange rates are presented in Figures 5.4 through 5.7. Figure 5.4 plots the response of the US real exchange rate to a typical shock in itself. The impulse is not permanent, but it continues for about 16 months after the initial shock. Initially the response is positive, then it becomes negative for about a 9-month period of time. After staying positive for about six month, the response approximately reaches its long-term position.

The Singaporean real exchange rate response to a typical shock in the US real exchange rate is displayed in Figure 5.5 Even though the response is initially positive, it fluctuates mostly within a negative area for about 12 months and then starts to move positive again. After that, the response cycles for a seven-month period, staying in both positive and negative regions. A long-term position is reached after 24 months. The shock has a transitory effect on the Singaporean real exchange rate. In addition this response is more volatile than that of the US real exchange rate to the same shock in the first years.

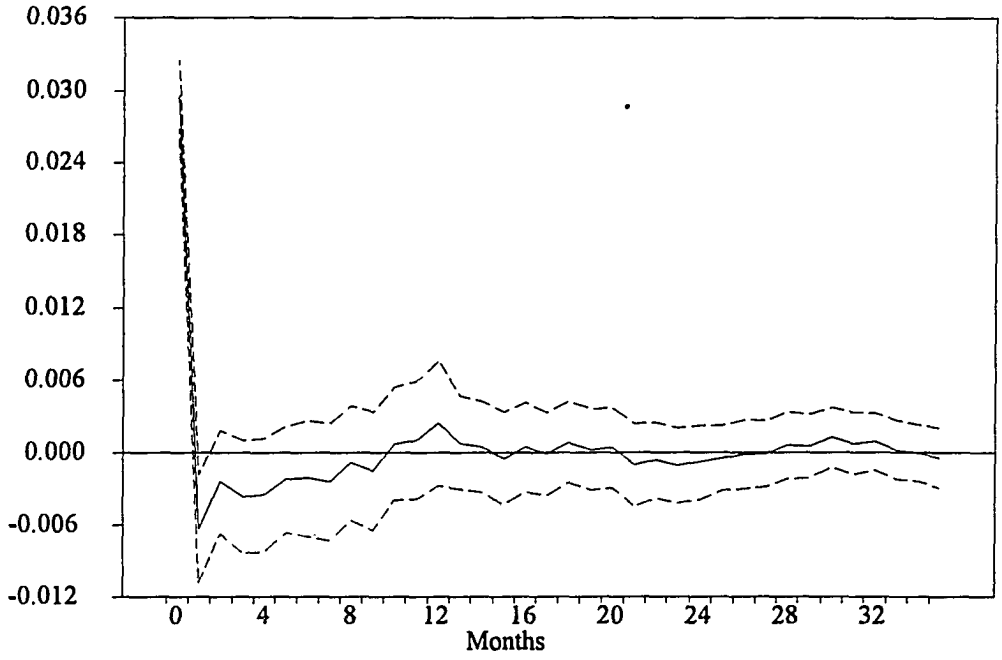

Figure 5.4. US real exchange rate response to a shock in the US real exchange rate.

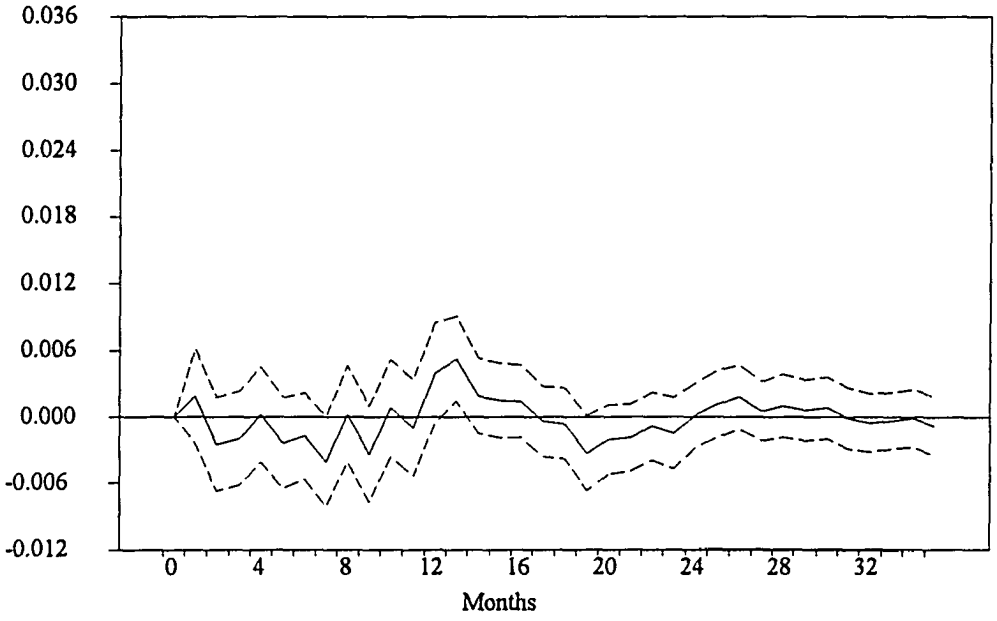

Figure 5.5. Singapore real exchange rate response to a shock in the US real exchange rate.

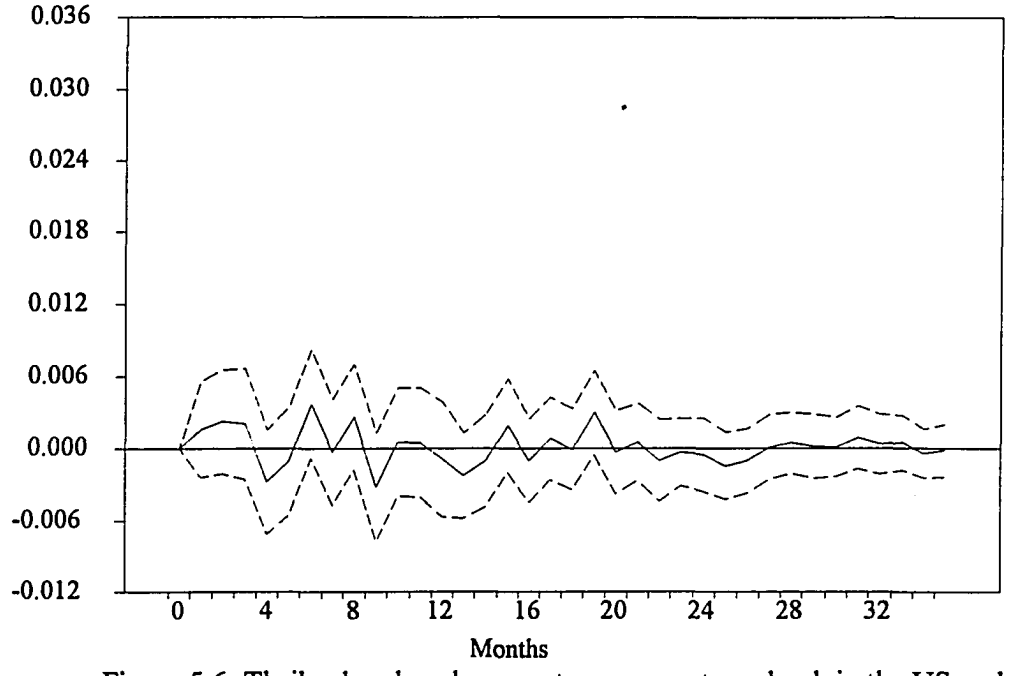

Figure 5.6. Thailand real exchange rate response to a shock in the US real exchange rate.

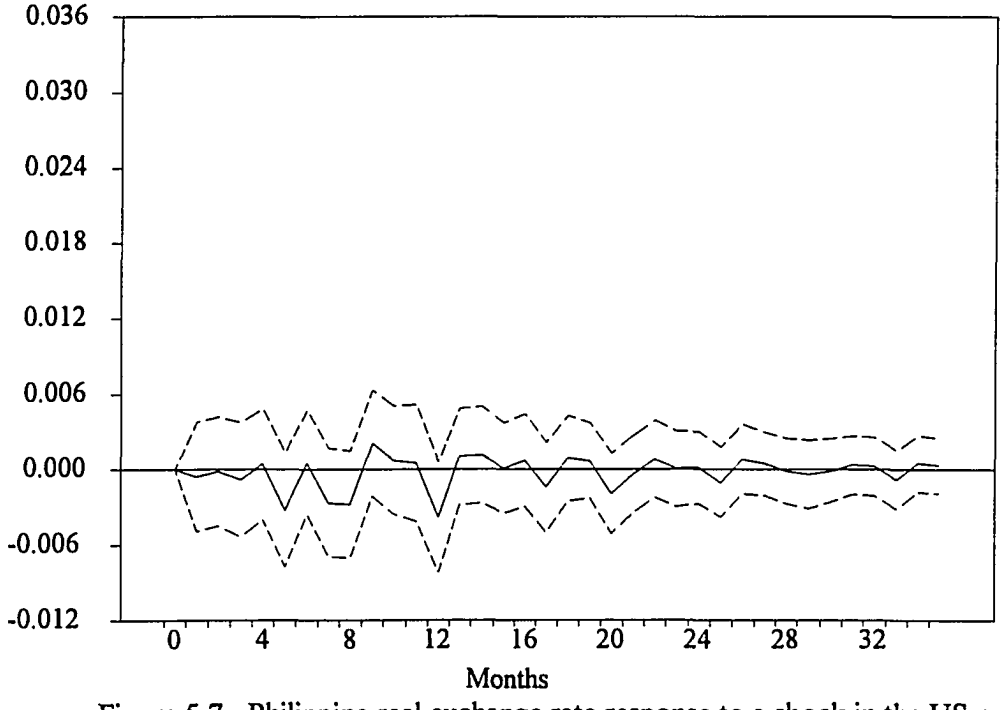

Figure 5.7. Philippine real exchange rate response to a shock in the US real exchange rate.

Figure 5.6 shows the responses of the Thailand real exchange rate to a standard error shock in the US real exchange rate. Because the response moves from its origin and back again to its origin, the impulse has a transitory effect on the Thailand real exchange rate. The effect continues for about 20 months after the initial shock. This response period is longer than that of the US real exchange rate, but shorter than that of the Singaporean real exchange rate with respect to a shock in the US real exchange rate. Moreover, the response is dominated by positive impulses, which is the reverse of the case for the Singaporean real exchange rate.

From Figure 5.7, it is clear that the effects of the shock on the Philippine real exchange rate are not permanent. The responses are very weak, especially during the first four months, but it continues for about 22 months before reaching its long-term position. Because the response is predominatly in the negative region, it is rational to state that the response is negative. These results suggest that the United State/Indonesian real exchange rate does not have a strong influence on the Philippines/Indonesian real exchange rate. In other words, the results signal that Indonesia might not consider the Philippines as a competitor in facing the US market.

The Japan-ASEAN Real Exchange Rate Case

Forcast Error Variance Decomposition Table 5.6 shows FEVD for the Japan-ASEAN group. It is clear from the results that the Japanese, Singaporean, and Philippine real exchange rates account for most of the forecast error variance; however, they are behave

differently. The Japanese, Singaporean and the Philippines real exchange ratesexplain about 75 percent, 48 percentand 56 percent their own forecast error variance after 24 months. The Thailand real exchange rate accounts for only 32 percent of its own forecast error variance after 24 months. This means that movements in the Thailand real exchange rate are mostly explained by changes in the other real exchange rates in the system.

Japan's feedback in response to typical shocks in other real exchange rates in the system are quite strong. This feedback is 37 percent, 36 percent, and 17 percent for shocks in the Singaporean, Thailand, and Philippine real exchange rates. This result suggests that the influence of Japan/Indonesian relative prices is strong in determining Singapore/Indonesian and Thailand/Indonesian relative prices. However, the influence is weak for the Philippine/Indonesian relative prices. Feedback in the Singaporean, Thailand and the Philippines real exchange rates accounts for only 10.25 percent, 6.11 percent, and 4.53 percent, respectively, of the Japanese real exchange rate forecast error variance.

FEVDs are also studied for real exchange rates with the order Singapore-Japan-Thailand-the Philippines. This study is motivated by the finding of the long-run relationships in the previous chapter. Singaporean and Japanese real exchange rate influences are almost the same with the results using the previous order. However, the Japanese real exchange rate response is less than the Singaporean real exchange rate response in comparison with the Singaporean real exchange rate response to the Japanese real exchange rate in the previous order. This result indicates that the Japanese real exchange rate is a leading variable in the system.

Table 5.6. Forecast error variance decomposition of Japanese and ASEAN real exchange rates.

Forecast error in	Forecast horizon *h*	Standard error	Proportions of forecast error variance *h* periods ahead accounted for by innovations in:			
			ΔJARE	ΔSIRE	ΔTHRE	ΔPHRE
ΔJARE	2	0.0339	97.67	1.38	0.11	0.84
	3	0.0342	96.09	1.41	0.97	1.52
	4	0.0345	94.40	2.86	1.23	1.50
	6	0.0366	85.55	6.02	3.90	4.52
	12	0.0388	79.20	7.54	7.02	6.22
	18	0.0396	76.31	8.87	8.21	6.61
	24	0.0399	75.30	9.38	8.51	6.81
ΔSIRE	2	0.0314	43.89	53.69	1.46	0.95
	3	0.0315	43.63	53.31	2.07	0.99
	4	0.0317	43.51	52.89	2.19	1.41
	6	0.0328	40.93	51.84	4.40	2.83
	12	0.0349	39.37	49.22	7.27	4.13
	18	0.0359	37.65	47.79	7.96	6.60
	24	0.0364	36.83	47.77	8.14	7.25
ΔTHRE	2	0.0326	39.54	23.30	34.00	3.16
	3	0.0327	39.27	23.37	33.76	3.59
	4	0.0329	38.81	23.27	33.31	4.61
	6	0.0341	36.78	23.50	34.61	5.11
	12	0.0355	37.04	24.26	32.68	6.01
	18	0.0359	36.49	24.53	32.22	6.76
	24	0.0362	36.10	24.72	32.15	7.03
ΔPHRE	2	0.0391	17.78	17.37	3.13	61.72
	3	0.0393	17.58	17.95	3.15	61.32
	4	0.0399	17.43	19.51	3.42	59.63
	6	0.0415	17.04	19.43	4.65	58.88
	12	0.0438	17.71	21.40	4.47	56.42
	18	0.0456	16.89	21.51	4.60	57.00
	24	0.0463	16.60	22.16	5.00	56.23

Overall, these empirical findings show that the US real exchange rate is more powerful than the Japanese real exchange rate in explaining its own forecast error and in influencing the ASEAN real exchange rates. In addition, the responses by the Thailand and Philippines real exchange rates to the Japanese real exchange rate shock are stronger than those to the US real exchange rate shock.

Impulse Response Function In Figures 5.8 through 5.11, the effects of a typical shock in the Japanese real exchange rate on itself, and on the Singaporean, Thailand and Philippines real exchange rates are displayed. From Figure 5.8, it is clear that the impulse effects on the Japanese real exchange rate are not permanent. The Japanese real exchange rate is volatile for the first nine months and more stable after that. The response approximately reaches its long-term position 16 months after the initial shock. This response pattern is different from that of the US real exchange rate in response to a shock in itself. The US real exchange rate responsepattern is more stable. However, the effects of a shock in both systems continue for the same period of time.

Figure 5.9 plots the Singaporean real exchange rate response to a standard error shock in the Japanese real exchange rate. The initial response is negative. Because negative response dominates positive response, the Singaporean real exchange rate has a net negative response to a shock in the Japanese real exchange rate. This response is the reverse of the response with respect to a shock in the US real exchange rate in addition to being more volatile. This finding seems to support the finding of a long-run relationship and FEVD.

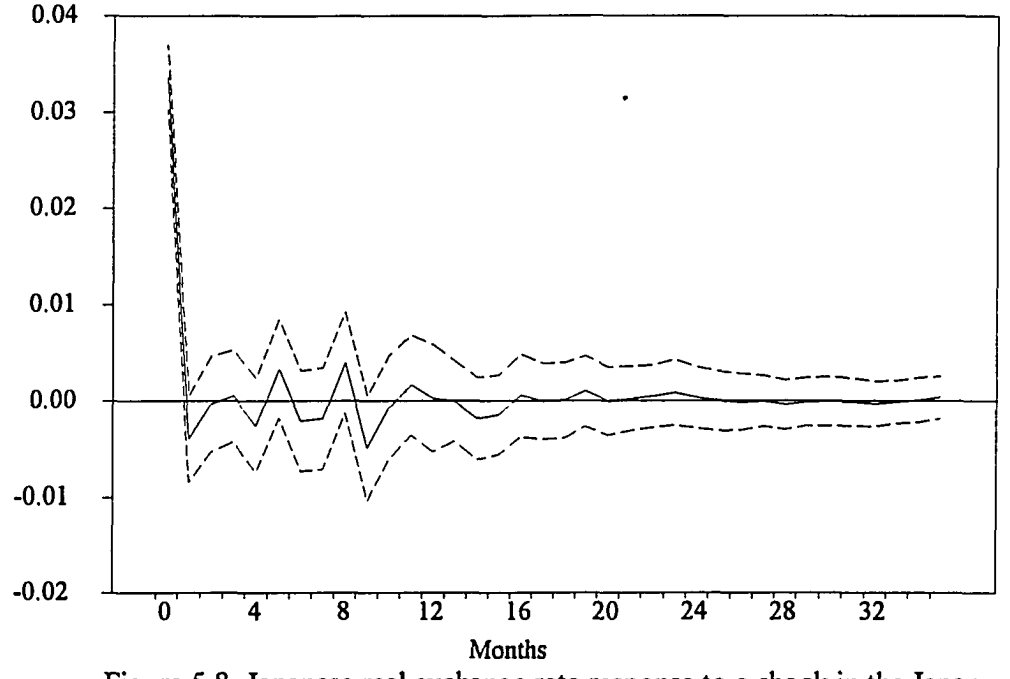

Figure 5.8. Japanese real exchange rate response to a shock in the Japanese real exchange rate.

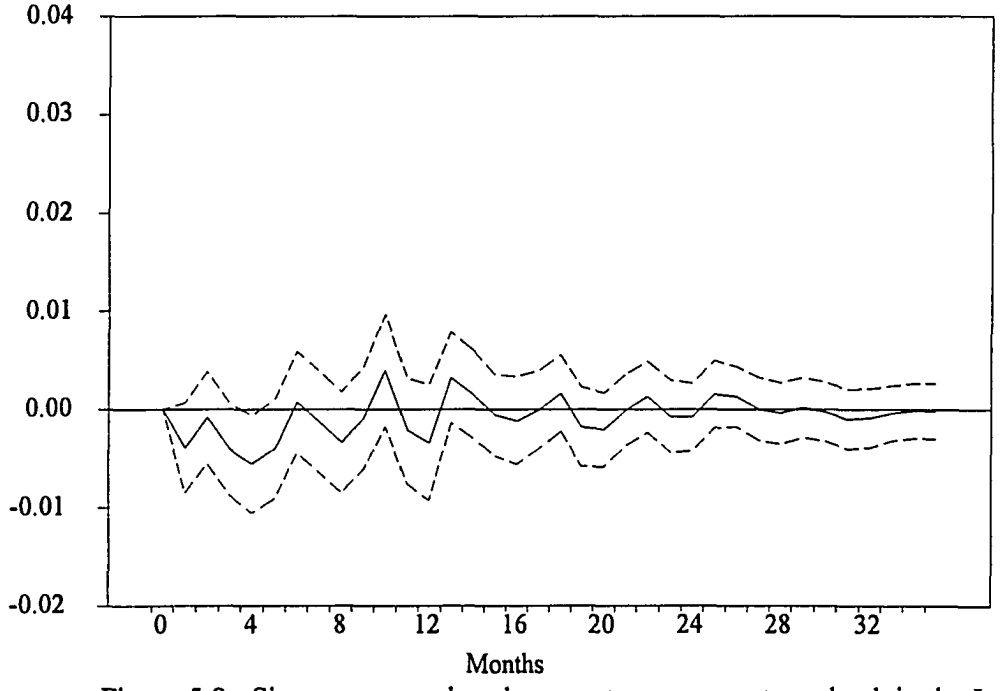

Figure 5.9. Singaporean real exchange rate responses to a shock in the Japanese real exchange rate.

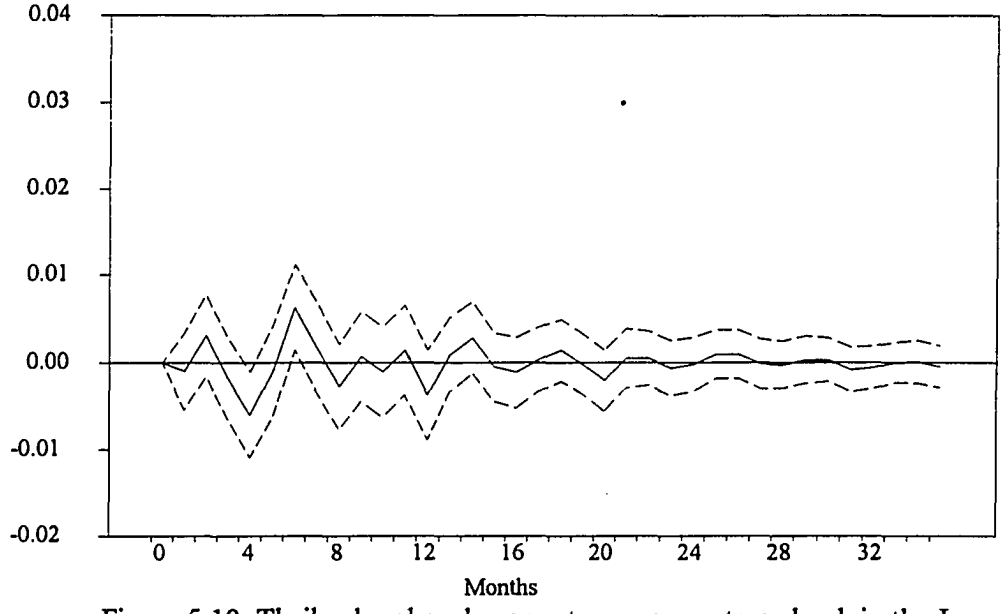

Figure 5.10 Thailand real exchange rate responses to a shock in the Japanese real exchange rate.

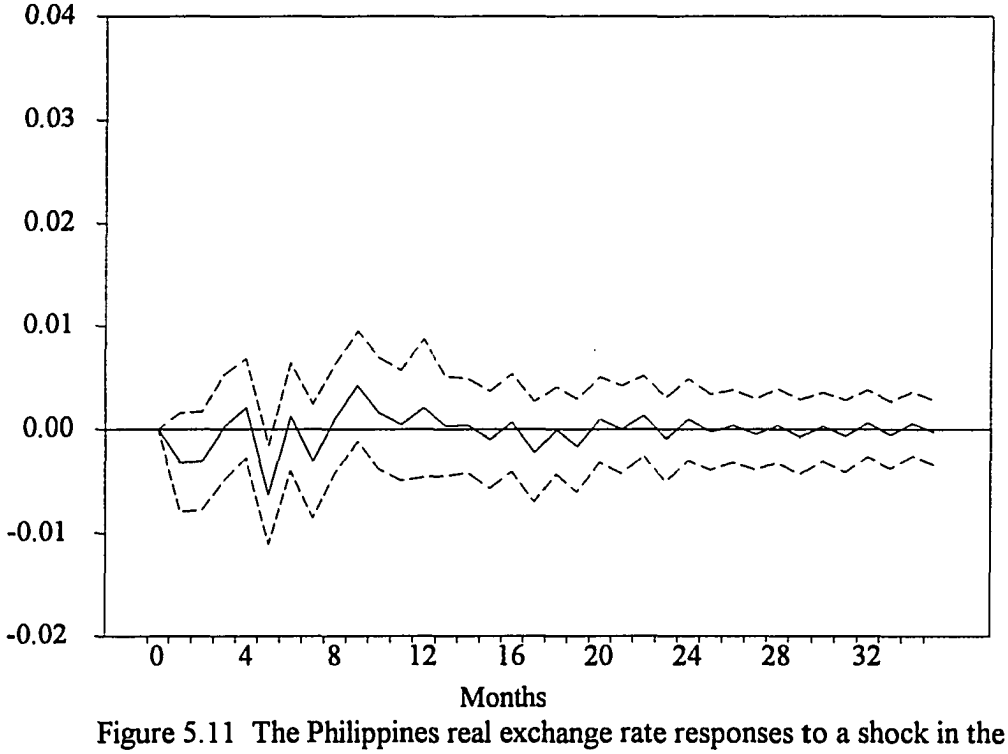

Figure 5.11 The Philippines real exchange rate responses to a shock in the Japanese real exchange rate.

Figure 5.10 displays the Thailand real exchange rate response to a typical shock in the Japanese real exchange rate. After initially being negative, the response moves to a positive region and then cycle again. The response is significant in the first ten months but less volatile than that of the Sinagaporean real exchange rate. Moreover, the impulse has a transitory effect, which continues for about 18 months after the initial shock. Compared to the response of this real exchange rate to a shock in the US real exchange rate, this response is less volatile and the initial response has a different direction.

The Philippine real exchange rate response, shown in Figure 5.11, is initially negative and then moves to the positive region. It reaches its negative peak at the fifth month and its positive peak at the tenth month after the initial shock. The shock has a transitory effect, which continues for approximately one year. The response seems to reach its long-term position after that. If we compare this response to that with respect to a shock in the US real exchange rate, this response is less volatile but stronger especially in the first four months. This result seems to suggest that United State/Indonesian relative prices have weaker influence on the movement of Philippines/Indonesian relative prices than on the movement of Japan/Indonesian relative price.

Major Trading Partners and Each ASEAN Real Exchange Rate Cases

This section explains how each of the ASEAN real exchange rates behaves in the major trading partner group of real exchange rates. The movements of the major trading

partners' real exchange rates are also of interest to this study. The South Korean real exchange rate is included as representative of the Pacific Rim from Asia but outside ASEAN.

The Major Trading Partner and Singapore Real Exchange Rate Case

Forecast Error Variance Decomposition Table.5.7 presents FEVD for the group of US-Japanese-German-Singaporean real exchange rates. Both the US and Japanese real exchange rates explain most of their own forecast error variance. For instance, the US real exchange rate accounts for 78 percent and the Japanese real exchange rate accounts for 51 percent of its own forecast error variance after 24 months. The German and Singaporean real exchange rates, however, account for only 36 percent and 32 percent, respectively, of their own forecast error variance after 24 months. These patterns of behavior are similar when the order of variables in the system is changed to Japan-the United States-Germany-Singapore.

The behavior of each real exchange rate based on the other real exchange rates in the system explains how strongly one real exchange rate influences the others. The US real exchange rate shows strong feedback in the Japanese, German, and Singaporean real exchange rates, accounting for 30 percent, 27 percent, and 48 percent of their respective forecast error variances after 24 months. The Japanese real exchange rate shows a significant (24 percent) feedback response only in Germany's forecast error variance. Its feedback in forecast error variance for the US and Singaporean real exchange rates are slightly low at 7 percent and 10 percent after 24 months. Feedback in Singapore's real exchange rate is

Table 5.7. Forecast error variance decomposition of major trading partner and Singaporean real exchange rates.

Forecast error in	Forecast horizon *h*	Standard error	Proportions of forecast error variance *h* periods ahead accounted for by innovations in			
			ΔUSRE	ΔJARE	ΔGERE	ΔSIRE
ΔUSRE	2	0.0295	98.27	0.05	1.64	0.03
	3	0.0299	96.47	0.27	1.63	1.63
	4	0.0302	95.55	0.37	1.81	2.26
	6	0.0309	92.10	1.29	3.53	3.08
	12	0.0327	83.47	5.77	4.17	6.59
	18	0.0337	79.44	6.56	5.09	8.91
	24	0.0341	78.02	6.84	5.60	9.52
ΔJARE	2	0.0340	34.87	60.01	1.20	3.92
	3	0.0397	34.37	57.92	2.24	5.47
	4	0.0350	34.19	57.46	2.84	5.49
	6	0.0363	34.40	54.50	5.42	5.67
	12	0.0390	31.73	53.02	6.66	8.59
	18	0.0403	30.54	52.02	7.69	9.75
	24	0.0407	30.53	51.32	8.18	9.97
ΔGERE	2	0.0357	30.64	24.02	42.32	3.02
	3	0.0368	30.76	22.73	41.20	5.30
	4	0.0369	30.75	23.04	40.92	5.28
	6	0.0378	30.18	22.69	40.77	6.36
	12	0.0406	27.75	24.39	37.22	10.63
	18	0.0423	26.82	24.55	36.88	12.09
	24	0.0431	27.50	23.99	35.99	15.52
ΔSIRE	2	0.0294	67.76	3.58	3.12	25.54
	3	0.0304	64.15	4.67	4.51	26.67
	4	0.0306	63.75	4.64	4.50	27.10
	6	0.0313	61.42	4.43	6.03	28.12
	12	0.0340	53088	8.76	6.74	30.62
	18	0.0368	48.74	10.01	9.17	32.08
	24	0.0379	48.12	10.22	9.43	32.23

stronger than feedback in the Japanese and German real exchange rates in response to a shock in the US real exchange rate. In response to a Japanese real exchange rate shock, Singapore's feedback is stronger than that of Germany. Furthermore, Singapore's real exchange rate accounts for 15 percent of Germany's real exchange rate forecast error variance. Interestingly, the attitude of Singapore's feedback for all other real exchange rates increases over time.

The US real exchange rate consistently shows strong feedback in response to other real exchange rates in the system when the order of variables is Japan-the United States-Germany-Singapore. In addition, the US real exchange rate response to a shock in the Japanese real exchange rate is higher than the feedback of the Japanese real exchange rate response to a shock in the US real exchange rate when they have the same place in variable order. The Singaporean and German real exchange rates did not show significantly different responses compared with the findings for the previous order of variables.

This empirical evidence suggests that the feedback of the US real exchange rate is exogenous and has stronger influence in the system than does the Japanese real exchange rate. The role of the Singaporean real exchange rate is also significant, especially compared to the role of the German real exchange rate. The US real exchange rate could be regarded as a leading variable in the currency area.

Impulse Response Function The impulse response function is estimated for the group of US-Japanese-German-Singaporean real exchange rates. The order is based on the

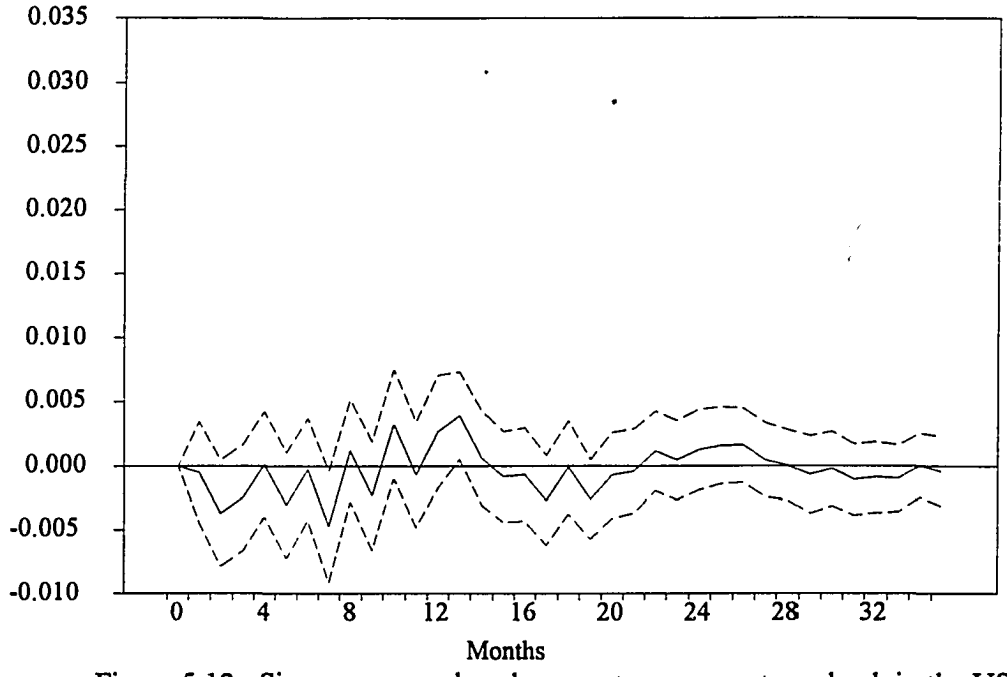

Figure 5.12. Singaporean real exchange rate response to a shock in the US real exchange rate.

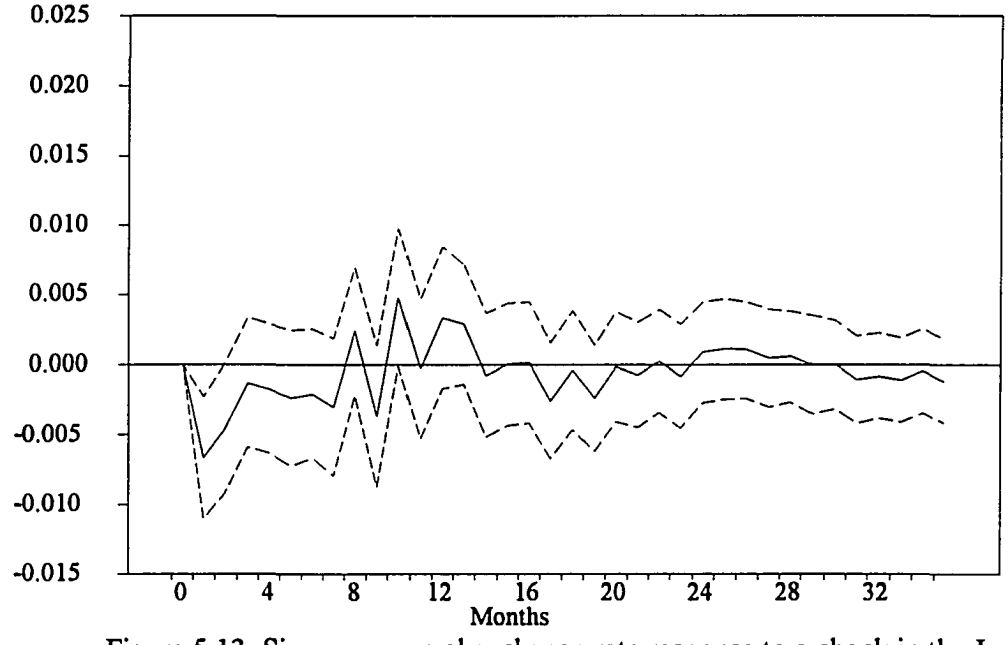

Figure 5.13 Singaporean real exchange rate response to a shock in the Japanese real exchange rate.

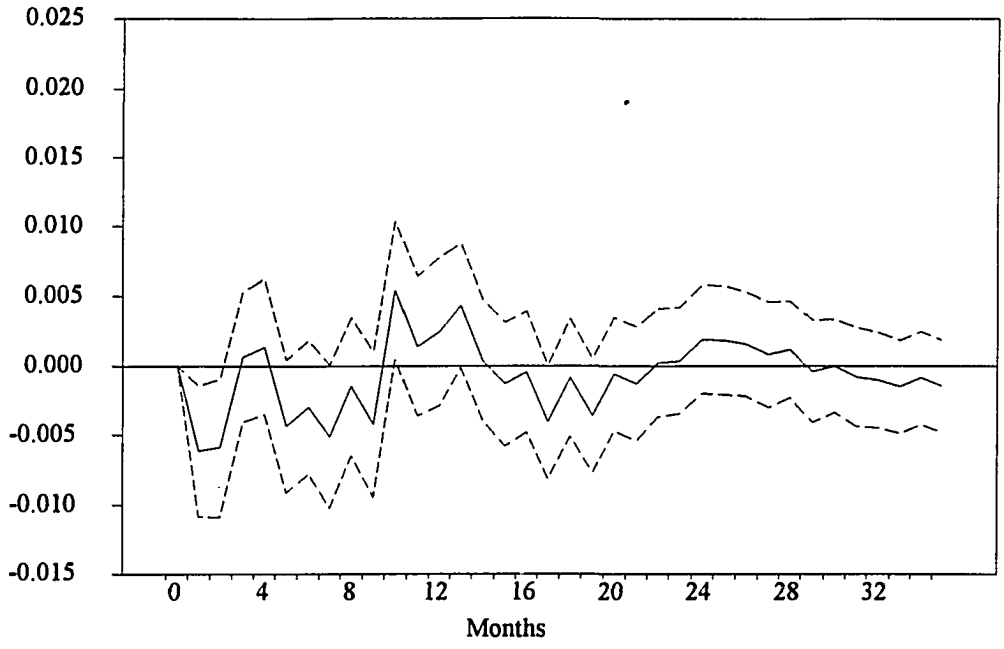

Figure 5.14 Singaporean real exchange rate response to a shock in the German real exchange rate.

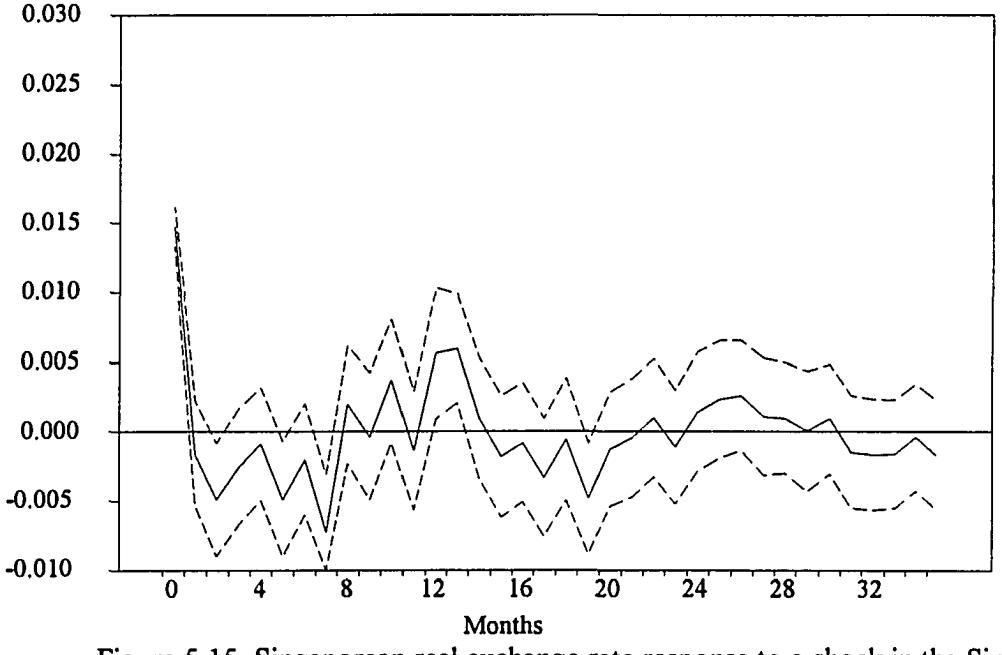

Figure 5.15 Singaporean real exchange rate response to a shock in the Singaporean real exchange rate.

results of the FEVD study. The focus of the present study, however, is to investigate how the Singaporean real exchange rate responds to a shock in major trading partner real exchange rates. This focus is a little different from the focus of the FEVD study above. Figures 5.12 through 5.15 plot the responses of the Singaporean real exchange rate to a shock in the US, Japanese, and German real exchange rates and to a shock in itself.

Figure 5.12 illustrates that a typical shock in the US real exchange rate has a transitory effect on the Singaporean real exchange rate. The effects continue for about 22 months after the initial shock. The impulse response to this shock is volatile in the first 12 months, and the initial response is negative. The response reaches its negative peak in the eighth month and its positive peak in the fourteenth month. In addition, negative response dominates positive response.

Figure 5.13 displays the response of the Singaporean real exchange rate to a shock in the Japanese real exchange rate. Again, the initial response is negative. The response increases after two months but decreases slightly again in the fourth month. After the eighth month, it starts to move to a positive region and becomes volatile. It is clear that the shock has a transitory effect which lasts for about 22 months after the initial shock. This response is stronger in attitude compared with the response of this real exchange rate with respect to a shock in the US real exchange rate.

The response of Singapore's real exchange rate to a shock in the German real exchange rate is different in attitude to the response of Singapore's real exchange rate with respect to the US and Japanese real exchange rates. The response to a shock in the German

real exchange rate is relatively stronger and also more volatile, especially in the first year. The plot of this is presented in Figure 5.14. The initial response is negative and directly reaches its negative peak, but then reaches its positive peak at the tenth month. Overall, negative response dominates positive response. The shock has a transitory effect on Singapore's real exchange rate and lasts for about 22 months.

Figure 5.15 plots the response of the Singaporean real exchange to a shock in itself. Again, the initial response is negative, but it starts from a positive region. The response is relatively volatile, reaches its negative peak in the eighth month, and reaches its positive peak in the fourteenth month after the initial shock. The shock has no permanent effect. Nevertheless, it lasts for about 26 months, which is longer than the effects on Singapore's real exchange rate with respect to shocks in the US, Japanese, and German real exchange rates.

The Major Trading Partner and Thailand Real Exchange Rate Case

Forecast Error Variance Decomposition FEVD of the group of US-Japanese-German-Thailand real exchange rates is presented in Table 5.8. Both the US and Japanese real exchange rates have similar behavior to the case of the United State-Japan-Germany-Singapore order. The pattern of variance decomposition for the German real exchange rate is identical as well. However, the US and Japanese real exchange rates account for about 2 percent more of Germany's forecast error variance in this group than that of the previous group.

Variance decomposition for the Thailand real exchange rate is dominated by US real exchange rate feedback response. This pattern is similar to that of the variance decomposition for the Singaporean real exchange rate, but the former is more significant. Feedback responses of the German real exchange rate to other real exchange rates, overall, are stronger than that of Thailand real exchange rate. This result suggests that Thailand's real exchange rate is less powerful compared to Singapore's real exchange rate relative to the real exchange rate of major trading partners. In other words, Thailand/Indonesian relative prices are mostly determined by major trading partner/Indonesian relative prices, whereas Singapore/Indonesian relative prices are less reliable.

The US real exchange rate exhibits consistent behavior when the order of real exchange rate variables is Japan-the United States-Germany-Thailand with respect to its own and other real exchange rate forecast error variances. However, the Thailand real exchange rate accounts for 19 percent (compared to 21 percent in the previous order) of its own forecast error variance after 24 months. The US real exchange rate explains 14 percent of Thailand's forecast error variance. If we compare this result to the feedback response of the Japanese real exchange rate when it has the same place as the US real exchange in the order (8 percent), it is clear that the United State/Indonesian real exchange rate has more influence than the Japan/Indonesian real exchange rate in determining the Thailand/Indonesian real exchange rate.

Table 5.8. Forecast error variance decomposition of major trading partner and Thailand real exchange rates.

Forecast error in:	Forecast horizon *h*	Standard error	Proportions of forecast error variance *h* periods ahead accounted for by innovations in:			
			ΔUSRE	ΔJARE	ΔGERE	ΔTHRE
ΔUSRE	2	0.0304	97.17	0.99	1.42	0.42
	3	0.0305	97.07	1.02	1.47	0.43
	4	0.0307	96.10	1.51	1.57	0.83
	6	0.0316	91.17	3.39	3.37	2.06
	12	0.0333	83.09	8.23	4.43	4.25
	18	0.0336	82.26	8.34	4.83	4.34
	24	0.0337	81.82	8.32	5.28	4.56
ΔJARE	2	0.0339	39.80	58.52	1.64	0.03
	3	0.0342	39.11	57.44	3.24	0.20
	4	0.0346	38.61	56.96	3.36	1.07
	6	0.0363	37.32	52.72	5.21	4.74
	12	0.0390	33.55	52.12	7.23	7.10
	18	0.0403	32.65	50.39	9.16	7.79
	24	0.0406	32.40	49.68	9.64	8.27
ΔGERE	2	0.0368	34.13	23.45	42.26	0.16
	3	0.0371	33.95	23.22	42.54	0.29
	4	0.0373	33.58	23.88	41.98	0.55
	6	0.0388	31.69	23.70	40.61	4.00
	12	0.0411	29.90	25.46	38.08	6.55
	18	0.0421	29.17	25.41	38.40	7.02
	24	0.0423	28.93	25.21	38.28	7.58
ΔTHRE	2	0.0327	77.42	0.88	2.08	19.61
	3	0.0327	77.41	0.88	2.16	19.55
	4	0.0329	76.64	0.87	2.67	19.81
	6	0.0342	72.05	2.49	4.11	21.35
	12	0.0359	66.10	6.34	6.23	21.41
	18	0.0363	64.85	6.87	6.86	21.43
	24	0.0365	64.52	6.87	7.15	21.45

Impulse Response Function The Thailand real exchange rate responses to a shock in the major trading partner real exchange rate was estimated based on the following order of real exchange rate variables: the United States-Japan-Germany-Thailand. This order is based on the results from the FEVD study above. Figure 5.16 plots the response of Thailand's real exchange rate to a shock in the US real exchange rate. The effect of the shock is not permanent. It is clear, however, that the shock has a transitory effect which lasts for about ten months. After that, the response has approximately reaches its long-term position. The response is not quite volatile, and the movement is mostly in the negative region. This attitude is quite different from those of Singapore's real exchange rate responses to the same shock. The significant differences are the direction of initial response, the frequency of fluctuations, and the long life of the effect on the real exchange rate movement. From these results, it is clear that the effects of a shock last longer in the Singaporean real exchange rate than in the Thailand real exchange rate. This result implies that a shock in the United State/Indonesian relative price has longer-lasting influence on the Singapore/Indonesian relative price than on the Thailand/Indonesian relative price.

The Thailand real exchange rate response to a typical shock in the Japanese real exchange rate is displayed in Figure 5.17. The response seems two months late compared with the response of this real exchange rate to shock in the US real exchange rate. Frequency of fluctuation in this case is less, but wider in range. Moreover, it is stronger. Effects of the shock last quite long--about 22 months--which is longer than the effects of a shock in the US

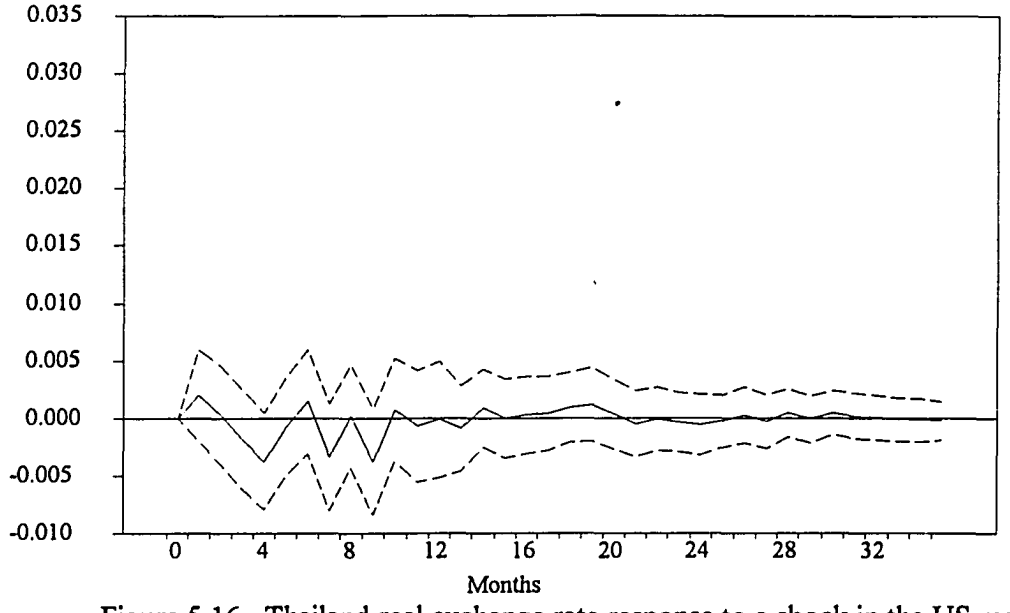

Figure 5.16. Thailand real exchange rate response to a shock in the US real exchange rate.

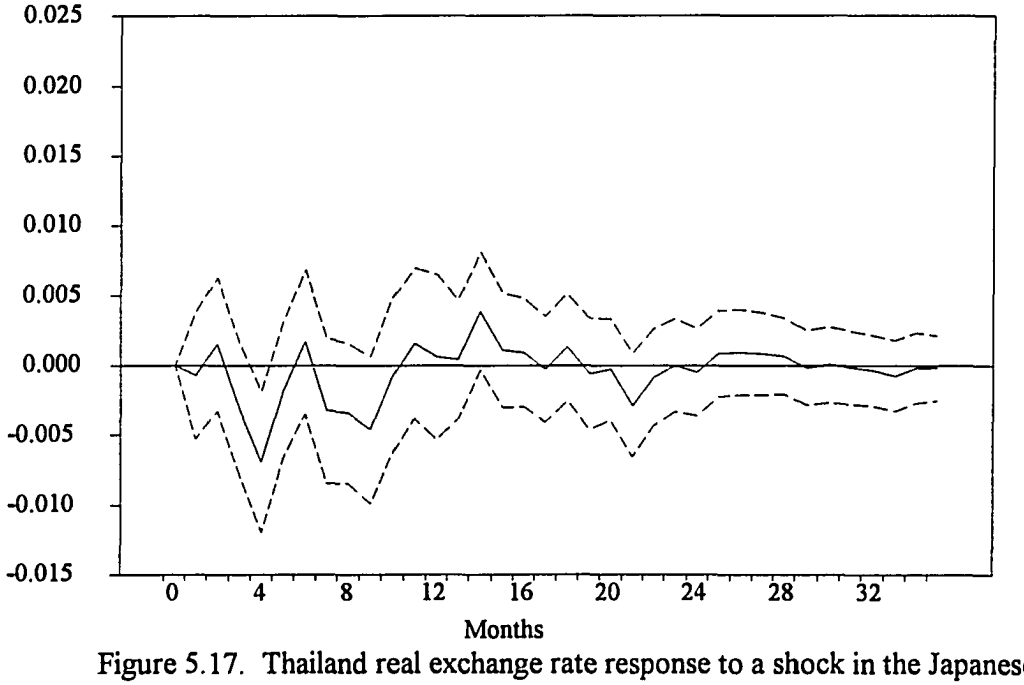

Figure 5.17. Thailand real exchange rate response to a shock in the Japanese real exchange rate.

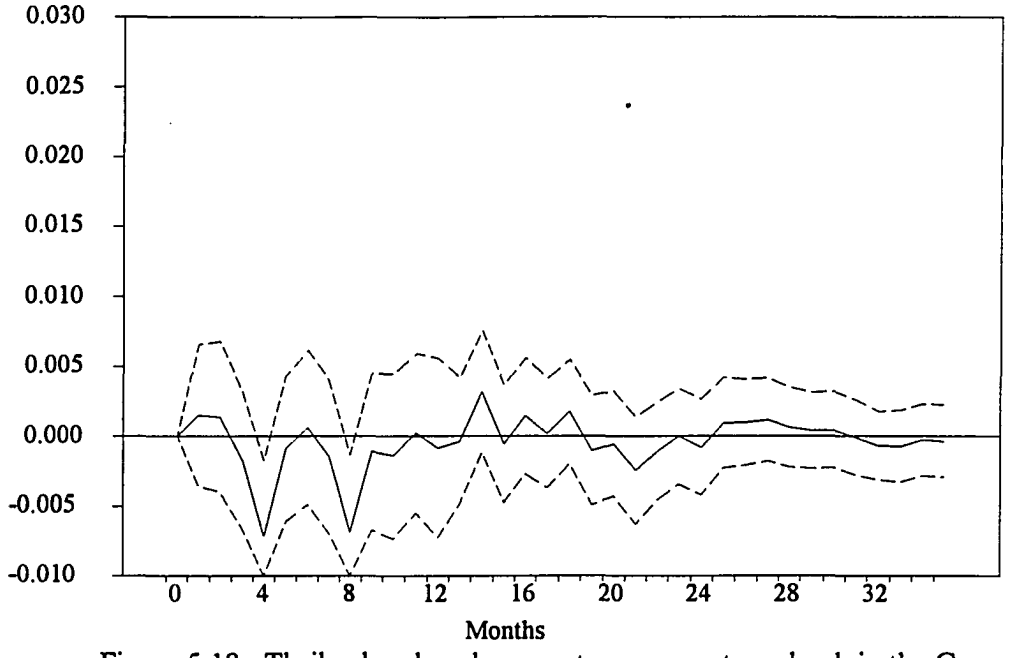

Figure 5.18. Thailand real exchange rate response to a shock in the Germany real exchange rate.

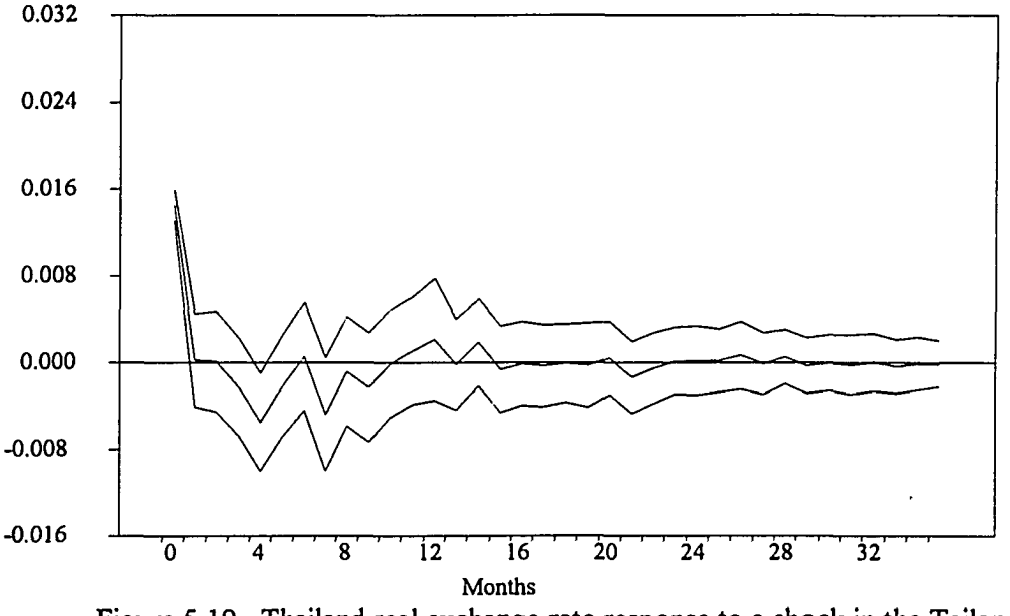

Figure 5.19. Thailand real exchange rate response to a shock in the Tailand real exchange rate.

real exchange rate last. Therefore, the results imply that the Japan/Indonesian relative price has a longer-lasting influence on the Thailand/Indonesian relative price than does the US/Indonesian relative price. Compared to the effects of the same shock on Singapore's real exchange rate, this response lasts for the same period of time. Singapore's real exchange response directly reaches its negative peak, whereas the Thailand real exchange rate is late to respond by about two months and reaches its negative peak in the fourth month after the initial shock.

A shock in the German real exchange rate has a transitory effect on the Thailand real exchange rate and lasts for about 22 months (see Figure 5.18). The response to the shock is negative and less volatile in the first 12 months. The frequency of fluctuations is similar to those of this real exchange rate with respect to a shock in the Japanese real exchange rate, especially in the first nine months, but different to those with respect to the US real exchange rate. Singapore's real exchange rate is more volatile. The similarity in responses is that they reach their long-term position at almost the same time.

The response of Thailand's real exchange rate to a shock in itself is presented in Figure 5.19. The effect is not permanent, but it has a transitory effect which lasts for about 14 months. The response is less volatile compared to that of Singaporean real exchange rate to a shock in the Thailand real exchange rate. The significant difference is that the effect of the shock has less persistence in the Thailand real exchange rate.

Table 5.9. Forecast error variance decomposition of major trading partner and the Philippines real exchange rates.

Forecast error in	Forecast horizon *h*	Standard error	Proportions of forecast error variance *h* periods ahead accounted for by innovations in			
			ΔUSRE	ΔJARE	ΔGERE	ΔPHRE
ΔUSRE	2	0.0296	97.67	0.13	2.13	0.07
	3	0.0298	97.22	0.14	2.45	0.19
	4	0.0300	96.68	0.27	2.54	0.50
	6	0.0305	91.19	2.26	3.95	2.60
	12	0.0331	82.51	7.35	5.40	4.73
	18	0.0336	80.50	8.19	6.07	5.26
	24	0.0338	80.30	8.34	6.06	5.30
ΔJARE	2	0.0337	35.59	62.23	1.74	0.44
	3	0.0342	35.27	60.53	3.41	0.77
	4	0.0346	35.52	59.79	3.81	0.77
	6	0.0367	35.07	55.14	4.84	4.28
	12	0.0391	33.26	55.14	6.48	5.12
	18	0.0404	32.58	55.01	6.97	5.44
	24	0.0407	32.96	54.65	6.95	5.44
ΔGERE	2	0.0365	31.42	23.11	43.25	2.22
	3	0.0371	31.92	22.39	43.13	2.56
	4	0.0375	31.82	22.89	42.29	2.99
	6	0.0384	31.55	23.25	41.26	3.94
	12	0.0408	30.76	25.32	38.36	5.56
	18	0.0418	30.22	25.98	37.50	6.29
	24	0.0421	30.17	26.14	37.31	6.38
ΔPHRE	2	0.0377	53.74	0.38	0.79	45.08
	3	0.0382	53.95	0.93	1.35	43.77
	4	0.0386	53.63	0.92	2.50	42.94
	6	0.0404	49.63	1.23	5.99	43.15
	12	0.0434	45.39	5.63	7.74	41.23
	18	0.0444	44.44	6.63	8.53	40.40
	24	0.0446	44.38	6.88	8.52	40.22

The Major Trading Partner and the Philippines Real Exchange RateCase

Forecast Error Variance Decomposition FEVD was examined for the real exchange rate variables of the order the United States-Japan-Germany-the Philippines. Table 5.9 presents the empirical results for this study. The US and Japanese real exchange rates show the same behavior as in the previous case studies. The behavior of the German and Philippine real exchange rates are identical to those of the German and Thailand real exchange rates in the previous case study. The Philippine real exchange rate, however, explains more of its own forecast error variance (40 percent) compared to those of the Singaporean (32percent) and Thailand (21 percent) real exchange rates after 24 months. This result seems to suggest that bilateral trade between the Philippines and Indonesia is a little different from bilateral trade Singaporeand Indonesia and Thailand and Indonesia.

The US real exchange rate again shows strong influence on the other real exchange rates in the system when we study FEVD for the real exchange rate variables for the group Japan-the United States-Germany-the Philippines. The Philippine real exchange rate, however, explains less of its own forecast error variance in this system, accounting for only 34 percent compared to 40 percent in the previous order. The feedback responses of the US and Japanese real exchange rates account for 38 percent and 21 percent, respectively, of the Philippine real exchange rate forecast error variances. If we compare these results to those of the previous order, there is a big difference. The US and Japanese real exchange rates explain 44 percent and 7 percent of the Philippines real exchange rate forecast error variance, respectively. These results indicate that the United State/Indonesian relative price has a

stronger influence than does the Japan/Indonesian relative price in the movement of the Philippines/Indonesian relative price.

The empirical evidence, overall, supports the US real exchange rate as an exogenous variable to the system. The Japanese real exchange rate also has a strong influence on the ASEAN real exchange rates. Therefore, it is clear that both the US and Japanese real exchange rates play significant roles in determining relative prices between the ASEAN countries and Indonesia. The US real exchange rate, however, seems more powerful in explaining ASEAN relative prices. Furthermore, the Germany/Indonesian relative price does not show a significant influence in determining relative prices in this currency area.

The Philippine real exchange rate seems more independent than the Singaporean and Thailand real exchange rates. The Philippine real exchange rate explains its own movement to a greater degree and gives less feedback in response to the movement in the real exchange rates of its major trading partners. Based on overall results, however, it might be more reasonable to conclude that the Singapore/Indonesian relative price plays a greater role in determining the United State/Indonesian, Japan/Indonesian, and Germany/Indonesia relative prices.

Impulse Response Function The present impulse response study is for a system with real exchange rate variables of the order the United States-Japan-Germany-the Philippines. As before, this study focuses on the influence of the major trading partner real exchange rates on the Philippine real exchange rate. Figure 5.20 plots the response of the

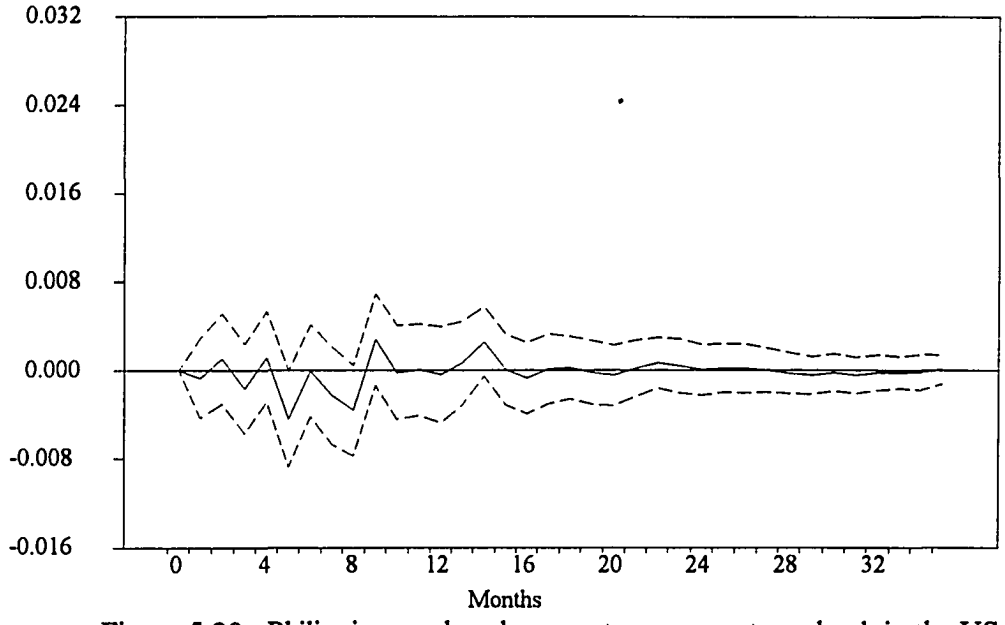

Figure 5.20. Philippines real exchange rate response to a shock in the US real exchange rate.

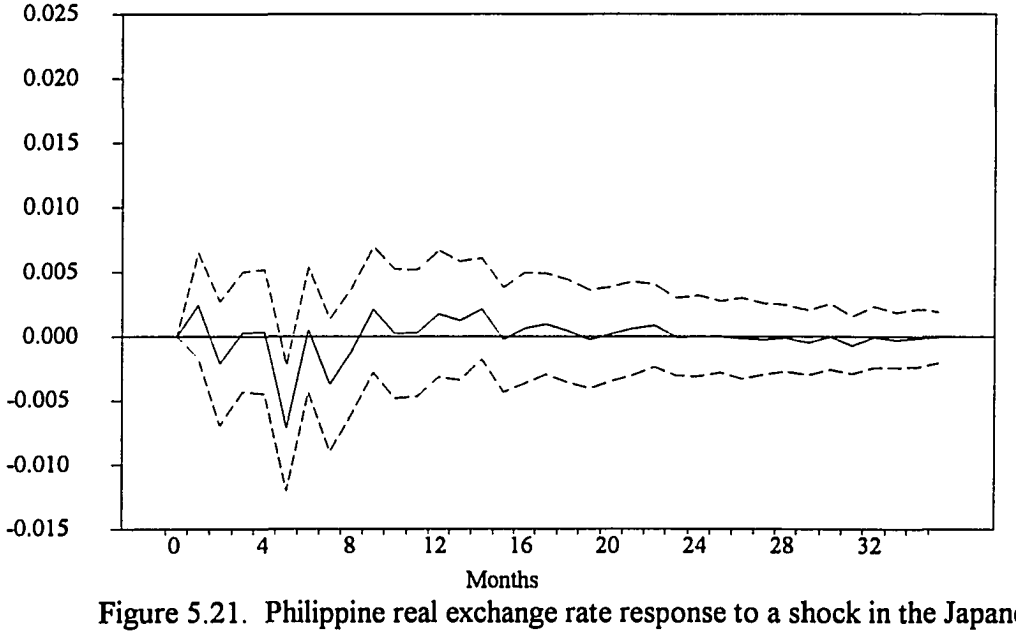

Figure 5.21. Philippine real exchange rate response to a shock in the Japanese real exchange rate.

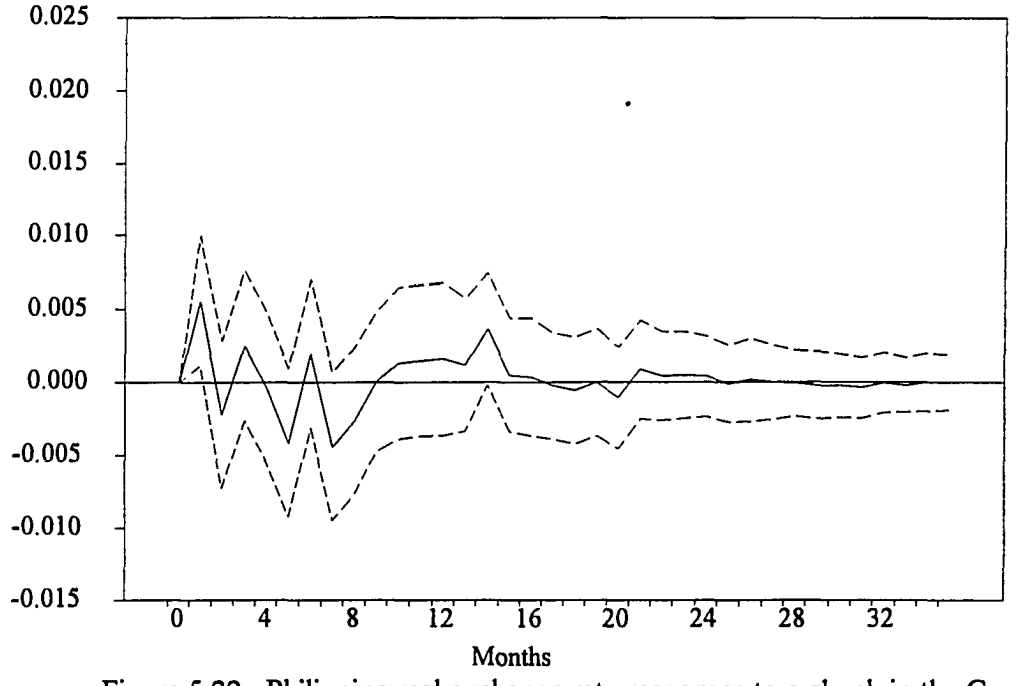

Figure 5.22. Philippine real exchange rate responses to a shock in the German real exchange rate.

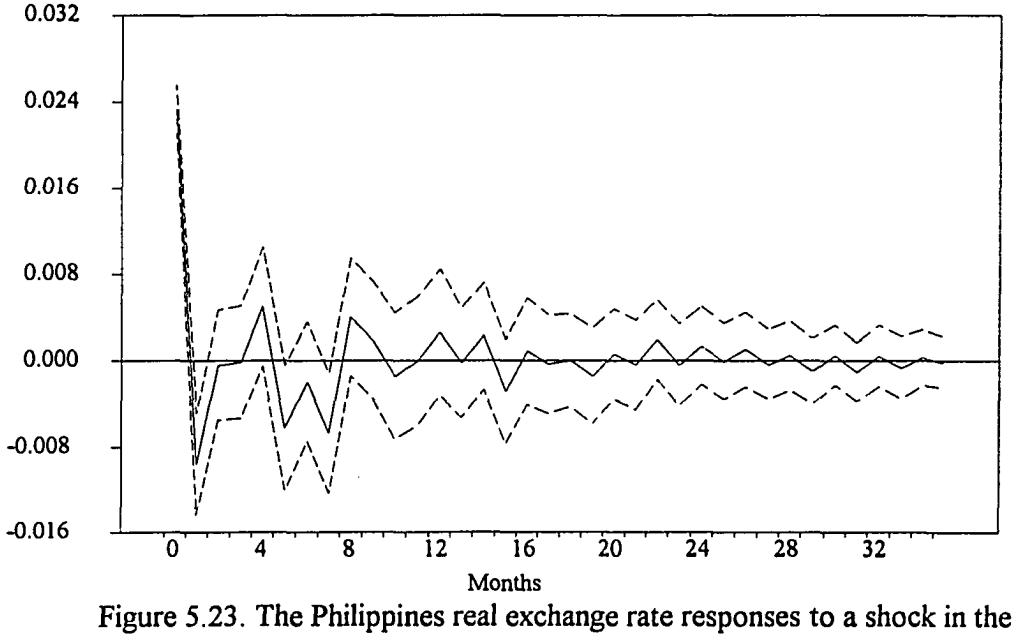

Figure 5.23. The Philippines real exchange rate responses to a shock in the Philippine real exchange rate.

Philippines real exchange rate to a typical shock in the US real exchange rate. The effect of the shock is not quite significant. Nevertheless, it lasts for about 16 months. The behavior of this response is similar to that of the Thailand real exchange rate, but is less volatile and shows less persistence than that of the Singaporean real exchange rate with respect to the same shock. This means the United State/Indonesian relative price has a lesser and shorter influence on the Philippines/Indonesian relative price. This finding supports the results of the FEVD study.

The response of the Philippine real exchange rate to a shock in the Japanese real exchange rate is displayed in Figure 5.21. The shock has a transitory effect on the Thailand real exchange rate, which lasts for about 14 months. The impulse response reaches its negative peak at the fourth month and is relatively strong. The pattern of response is slightly different from that of the Singaporean and Thailand real exchange rates with respect to the same shock. For all three responses, the Thailand real exchange rate response is more stable than the other two responses. If we compare this response to that of the Thailand real exchange rate with respect to the shock in the US real exchange rate, the former is more volatile but reaches its long-term position in the same time.

Figure 5.22 presents the Philippine real exchange rate response to a typical shock in the German real exchange rate. The effect of the shock is also transitory and lasts for about 22 months after the initial shock. The response, which is initially positive, is volatile for the first eight months and more stable after that. The attitude of this response is different than that of the Philippine real exchange rate with relation to shocks in the US and Japanese real

exchange rates. Compared to the Singaporean and Thailand real exchange rate responses to the same shocks, however, this response moves cyclically between positive and negative regions, whereas the other two are dominated by a negative response for the first eight months, but the responses are shorter. The possible interpretation of this result is that the Germany/Indonesian relative price has a relatively weak influence on the Philippines/Indonesian relative price.

The shock in the Philippine real exchange rate has no permanent effect on the exchange rate itself. This is clear from the plot presented in Figure 5.23. The response is very volatile and seems similar to the behavior of the Singaporean real exchange rate in response to a shock in itself. It is significantly different from the real exchange rate response with respect to shocks in the US, Japanese, and German real exchange rates. The most important difference is that this response is stronger and lasts longer. This result suggests that the Philippines/Indonesian relative price mostly influences itself. In other words, it is the most independent of the ASEAN real exchange rates when they are grouped with major trading partner real exchange rates.

The Major Trading Partner and South Korean Real Exchange Rate Case

Forecast Error Variance Decomposition Table 5.10 reports FEVD for the group of the United States-Japan-Germany-South Korea. Both the US and Japanese real exchange rates show identical patterns of behavior, as in the case of the group of major trading partners and each ASEAN real exchange rate. The South Korean real exchange rate

accounts for 21 percent of its own forecast error variance, which is less than the Singaporean real exchange rate accounts for. Moreover, the feedback response of the South Korean real exchange rate is weaker than that of the Singaporean real exchange rate. Therefore, the empirical evidence shows that the Singapore/Indonesian relative price is a leading variable for Indonesia in determining relative prices with respect to the major trading partners. In other words, we find more support for considering that Singapore is also a major trading partner for Indonesia.

The same pattern was given by the study of FEVD for real exchange rate variables in the system of Japan-the United States-Germany-South Korea. Consistently, the US real exchange rate shows major influences on all real exchange rates in the system. With respect to the German real exchange rate, the South Korean real exchange rate has a smaller feedback response in the US and Japanese real exchange rates. It is clear, then, that the South Korean real exchange rate depends on all major trading partner real exchange rates.

Impulse Response Function The impulse response function is studied for a system with the order of the United States-Japan-Germany real exchange rates. Figure 5.25 clearly shows that the effects of a typical shock in the US real exchange rate on the South Korea/Indonesian real exchange rate is very weak. The results seem to suggests that the United State/Indonesian relative price has no influence in determining the South Korea/Indonesian relative price. This response is quite different from that of the Singaporen real exchange rate response to a shock in the US real exchange rate.

Table 5.10. Forecast error variance decomposition of the major trading partner and South Korean real exchange rates.

Forecast error in:	Forecast horizon *h*	Standard error	Proportions of forecast error variance *h* periods ahead accounted for by innovations in			
			ΔUSRE	ΔJARE	ΔGERE	ΔKORE
ΔUSRE	2	0.0305	96.71	0.71	2.50	0.07
	3	0.0305	96.66	0.72	2.53	0.08
	4	0.0308	95.50	0.95	2.66	0.87
	6	0.0316	91.19	3.46	4.47	0.88
	12	0.0329	85.14	7.97	5.73	1.15
	18	0.0332	84.37	8.30	6.02	1.31
	24	0.0334	83.86	8.36	6.11	1.67
ΔJARE	2	0.0340	58.12	58.12	1.84	0.73
	3	0.0343	57.18	57.18	3.03	0.97
	4	0.0348	56.17	56.17	3.41	2.56
	6	0.0362	54.86	54.86	5.54	2.86
	12	0.0383	54.05	54.05	7.61	3.75
	18	0.0394	53.39	53.47	7.86	4.09
	24	0.0395	52.74	52.74	7.95	4.55
ΔGERE	2	0.0367	33.45	23.47	42.91	0.16
	3	0.0373	32.94	22.93	43.39	0.74
	4	0.0379	31.96	23.21	42.10	2.72
	6	0.0388	30.57	25.05	41.56	2.81
	12	0.0407	29.37	26.28	39.56	4.80
	18	0.0414	29.10	26.52	39.00	5.38
	24	0.0416	29.10	26.28	39.00	5.62
ΔKORE	2	0.0325	75.01	0.67	2.87	21.45
	3	0.0329	73.75	1.26	3.84	21.15
	4	0.0334	72.84	1.50	4.35	21.32
	6	0.0341	70.83	2.49	5.84	20.84
	12	0.0354	66.42	6.42	6.44	20.72
	18	0.0357	65.62	7.08	6.55	20.75
	24	0.0359	65.23	7.13	6.79	20.85

The effects of a shock in the Japanese real exchange rate on the South Korean real exchange rate, however, are relatively significant. .Figure 5.26 shows that the impulse fluctuates but does not have a permanent effect. Compared to the Singaporean real exchange rate response to the same shock, this response is more stable and reaches its long-term position earlier. From this finding, we might conclude that the influence of the Japanese real exchange rate on the South Korean real exchange is weaker than its influence on the Singaporean real exchange rate.

Figure 5.27 shows the response of the South Korean real exchange rate to a shock in the German real exchange rate. The shock has a transitory effect. The response is volatile for the first 12 months, and approximately reaches its long-term position after 20 months. The behavior of this response is different than that of the Singaporean real exchange rateto the same shock. The initial response in the present study is positive; however, it is weaker and less volatile.

Theresults show a weak response in the South Korea real exchange rate to a shock in itself. The movement of the impulse, plotted in Figure 5.28, is quite stable and stays within a small range. Nevertheless, the effects of the shock last for about 20 months. This response is significantly different from that of the Singaporean real exchange rate to the same shock.

Overall, the responses of the South Korean real exchange rate to itself and to shock in other real exchange rates in the system are weak and approximately reache their long-term position in a relatively short period of time. These responses are all different from those of the

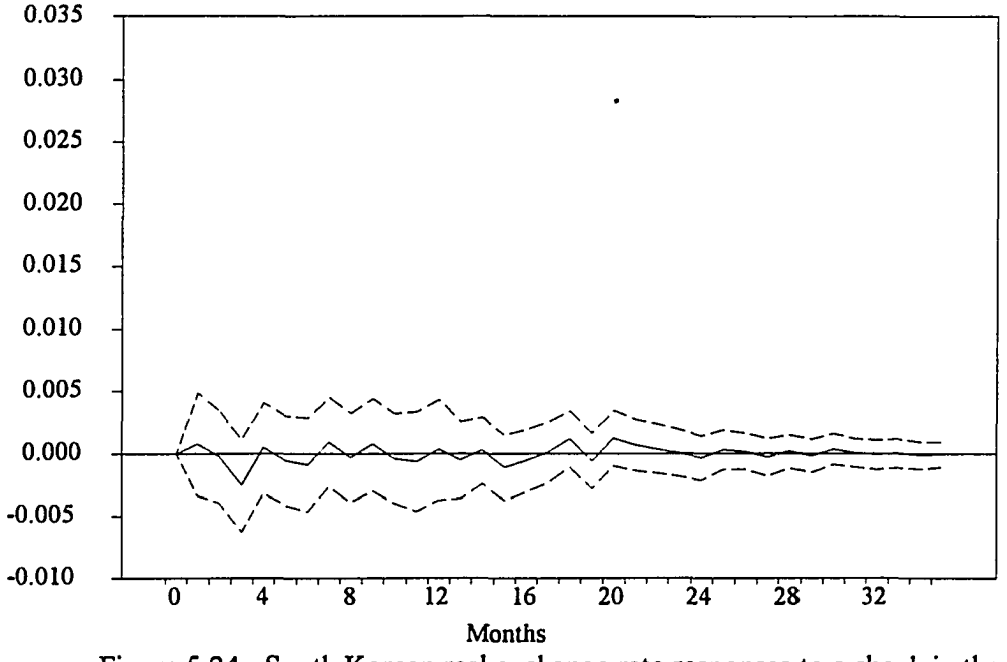

Figure 5.24. South Korean real exchange rate responses to a shock in the US real exchange rate.

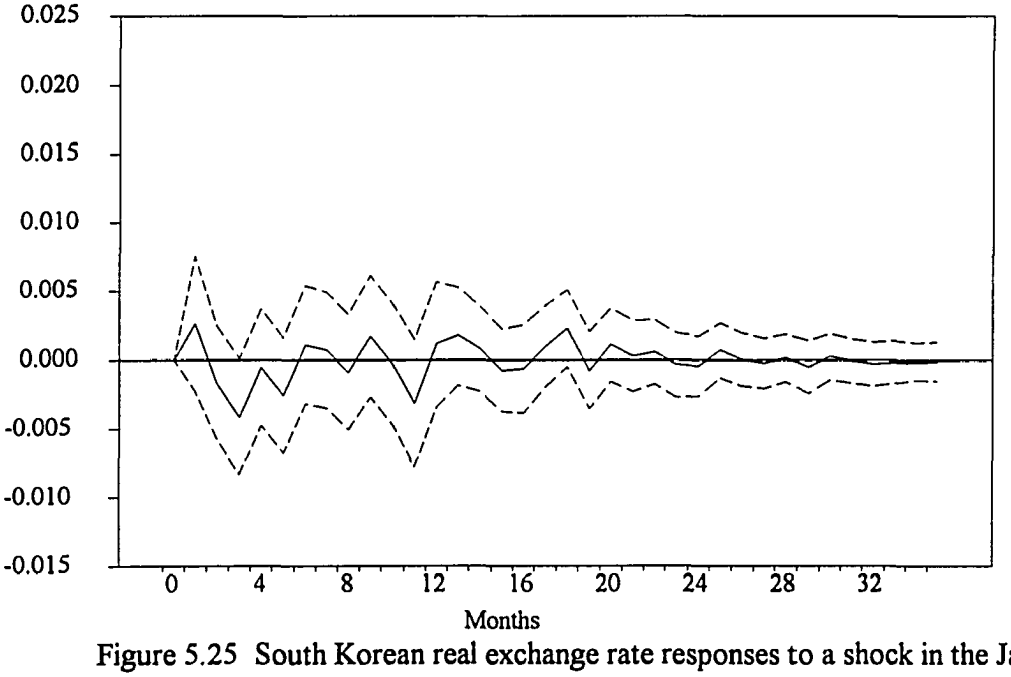

Figure 5.25 South Korean real exchange rate responses to a shock in the Japanese real exchange rate.

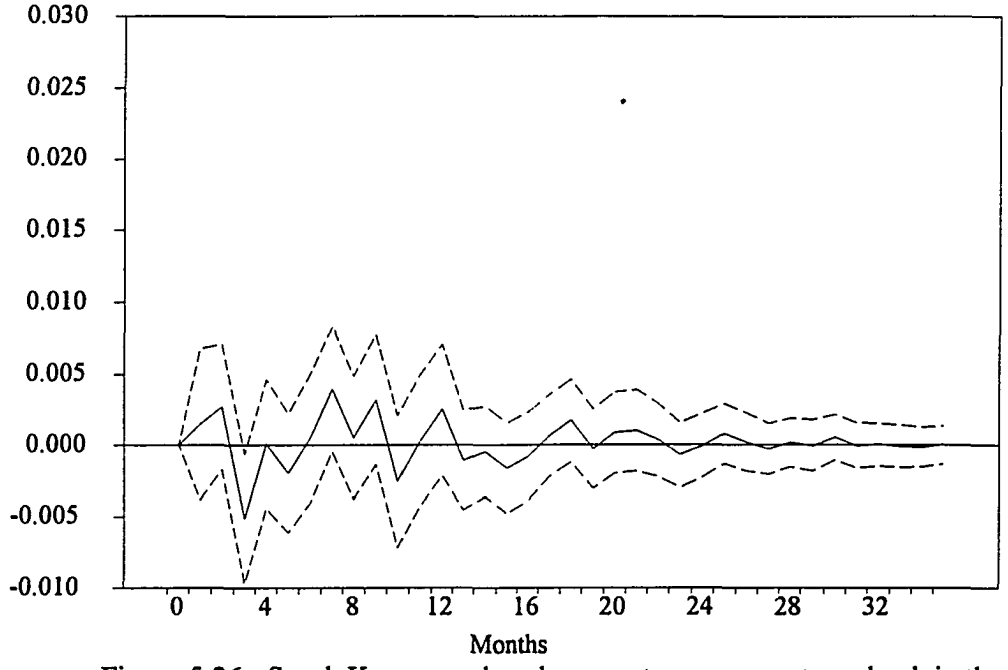

Figure 5.26. South Korean real exchange rate responses to a shock in the German real exchange rate.

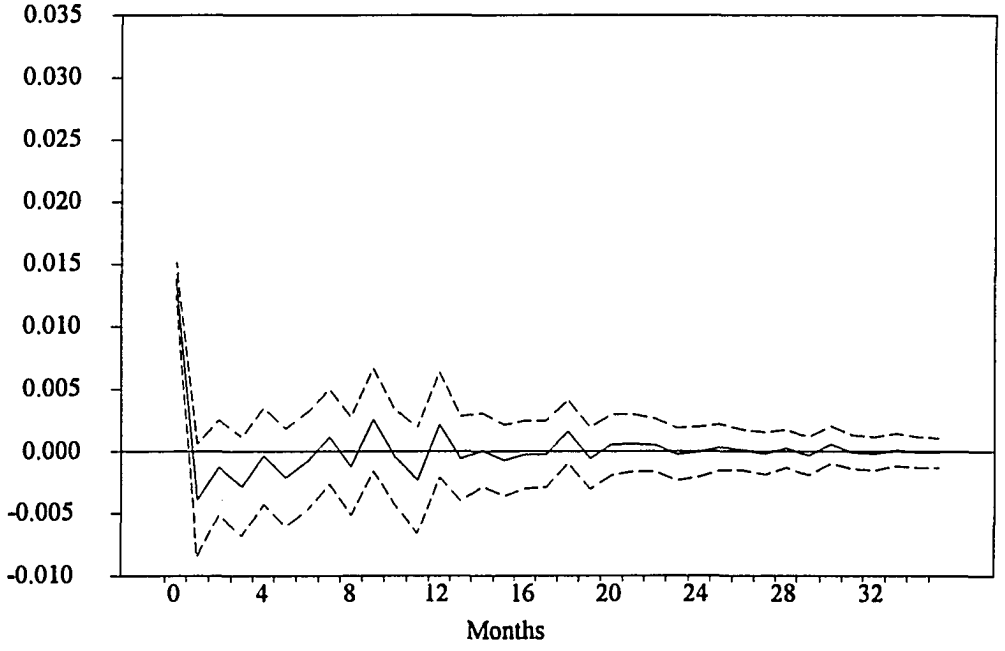

Figure 5.27. South Korean real exchange rate responses to a shock in the South Korean real exchange rate.

Singaporean real exchange rate to the some shocks. These results might suggest that the South Korea/ Indonesian relative price for Indonesia in facing competition in the United State, Japan and Germany as well as in South Korea, and Singapore.

Summary and Conclusions

In this chapter, we studied the short-run dynamics of Generalized-PPP and interrelationships among real exchange rates in a specific currency area in the presence of structural change. The study of the short-run dynamics of Generalized-PPP is pursued by estimating an error correction model, and interrelationships among real exchange rates are estimated by estimating FEVD and impulse response functions.

The empirical results of the error correction models mostly support the importance of structural change dummy and error correction variables, although a few of the models reject both variables at the same time. The rejections, however, do not weaken the importance of both variables since some of the models in the system support them--for instance, the case of the Japanese and Singaporean real exchange rate models in the system of the Japanese, Singaporean, Thailand and Philippine real exchange rates.

From the study of FEVD and impulse response functions, the movement in the real exchange rates of ASEAN countries and South Korea are influenced by shocks or surprises in major trading partner real exchange rates. An interesting result is that the US real exchange rate has a stronger influence than the Japanese real exchange rate. Among the ASEAN real

exchange rates, the Singaporean real exchange rate shows stronger influence. In addition, the US and Singaporean real exchange rates show strong influences in the system of the US-ASEAN real exchange rates. Also the Japanese and Singaporean real exchange rates shows strong influences in the system of Japan-ASEAN real exchange rates.

CHAPTER 6. SUMMARY AND CONCLUSIONS

Indonesia is representative of the world's growing economies and earned a reputation for its willingness to undertake liberal economic reforms during the 1980s. Reforms for stabilization and market-oriented trade and industrial policies that were introduced continuously have created a more outward-looking economy. Significant structural change, starting in March 1983, began with liberalization of the exchange rate system. Because policy changes in the Indonesian economy were implemented in all economic sectors and continuously adjusted, March 1983 was chosen as the breaking point for the Indonesia economy. This date is accounted for throughout the empirical study.

One of the primary aims of this research is to investigate the validity of PPP and of Generalized-PPP in the presence of structural change for the ASEAN countries and their major trading partners in which Indonesia is as a base country. The Unit root test in the presence of structural change suggested by Perron (1989) was applied. The test indicated that the bilateral real exchange rates of ASEAN countries--the Philippines, Singapore, and Thailand-- and their major trading partners--Germany, Japan, and the United states-- were all nostationary processes for the period January 1974 to October 1992. For all real exchange rates, Indonesia was used as the base country. The test was conducted using data on real exchange rates constructed by WPI, WPI without oil for Indonesia, CPI, and the nominal

exchange rate of Indonesia with all the countries studied. These result, as expected, did not support the validity of PPP, but led to the investigation of the validity of Generalized-PPP.

Cointegration test for the validity of Generalized-PPP in the presence of structural change are presented. Empirical results support the validity of Generalized-PPP for the ASEAN; the United States-ASEAN and Japan-ASEAN groups; and the major trading partners and each ASEAN country and the South Korea real exchange rate groups. The of the long-run relationship in every group that constitutes a currency area in the sense of Generalized-PPP suggests that deviation in Generalized-PPP is mostly from the tendency of real exchange rates to depreciate.

Because Generalized-PPP held for some groups of real exchange rates, those groups of countries can be interpreted as an economic system that constitutes as currency area. This result provides a justification for estimating the short-run dynamics of the Generalized-PPP and for investigating interrelationships among real exchange rates within the system. Most empirical evidence from the study of the short-run dynamics of Generalized-PPP support the importance of the error correction and structural change dummy variables.

The interrelationships of real exchange rates within each group that supports Generalized-PPP was studied through the estimation of FEVD and impulse response functions. Among ASEAN real exchange rates, Singapore's real exchange rate shows the strongest influence on the other real exchange rates within the group. From the studies of the interrelationships of the United states-ASEAN and Japan-ASEAN real exchange rates, the US real exchange rate is more stable than Japanese real exchange rate in response to shocks in

each ASEAN country real exchange rate. If the real exchange rate is interpreted as the relative price in Indonesia with that in the other countries, the results tell us that Indonesia-US bilateral trade is more stable than Indonesia-Japanese bilateral trade, given that the ASEAN countries are Indonesia's competitors for the US and Japanese markets.

Another suggestion from the study of FEVD and the impulse response function is that the movements in the real exchange rates of the ASEAN countries and South Korea are strongly influenced by a shock in the real exchange rates of the major trading partners. An interesting result is that the US real exchange rate has stronger influence on the movement of the ASEAN and South Korea real exchange rates than does the Japanese real exchange rate. This result might be interpreted as a signal that the United States has more influence than does Japan in the economies of Pacific Rim nations.

From this study of the long-run relationships, FEVD, and impulse response functions, there is evidence that Singapore's real exchange rate has more influence on the other real exchange rates than does the German real exchange rate. This results suggests that the role of Singapore's market is greater than the role of Germany's market in the Indonesia economy. In addition, there is some indication that Singapore's real exchange rate exhibits similar behavior, even though it is less strong, to shocks in the US and Japanese real exchange rates with respect to other real exchange rates in this study. Based on these results, the United States, Japan, and Singapore are all shown to be reasonable major trading partners for Indonesia.

For further research, it might be interesting to continue this study by investigating the influence of the permanent and transitory components of the United states/Indonesian,

Japan/Indonesian, and Singapore/Indonesian real exchange rates on the trade balances of Indonesia with the United states, Japan, and Singapore. The permanent and transitory components of real exchange rates could be computed by following Blanchard and Quah's (1989) methodology.

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