THE EAST-ASIAN FINANCIAL CRISIS AND A COMPARATIVE ANALYSIS OF THE EAST AFRICAN ECONOMIES

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Abstract

This study empirically tests the theory that pegged exchange rate regimes significantly contributed to the East Asian Financial crisis. Granger causality effect is tested in relationships between exchange rates, differential interest rates and the balance of payments components from 1981 to 1999 using ECM, VAR and ADL models.

The results confirm that pegged exchange rate regimes in a near perfect capital mobility economy are incapable of controlling massive foreign currency flows depleting international reserves. Also, monetary policies implemented under pegged exchange rate regimes in Indonesia, Thailand and Korea maintained high investment returns at the expense of the external balance. The disparities between results of real and nominal variables provide an insight in identifying periods of financial distress prior to a crisis.

A comparative analysis is undertaken to determine warning signs of crises in the East African region by comparing its macroeconomic activities to those of the East Asian region. The Chow's test for structural breaks reveal significant differences and similarities but does not identify any warning signs of future crises similar to the East Asian Financial Crisis.

CHAPTER 1

INTRODUCTION

The Asian financial crisis[1] of 1997 and 1998 began as a currency crisis[2] with a massive run on the Thai baht. This spread by "contagion effect[3]" to other Southeast Asian economies, deepening to a financial crisis and finally escalating into an economic crisis characterized by severe recession in most countries (Lim 1999).

The crisis came as a surprise to almost everyone. Upon post-mortem analysis it was defined by many economists as expected for an economy that was undergoing a highly accelerated economic boom fueled by unchecked massive foreign capital flows. East Asia's long track record of economic success was one of the reasons the crisis came as a surprise. Dramatic annual growth and high investment returns seemed the norm of East Asia, the standard for "the Asian Model" in the 80s and early 90s (Lissakers 1999). Domestic savings and investment rates averaged more than 30 percent of GDP between 1986 and 1996 in Indonesia, Thailand, Korea and Malaysia and 20 percent in Philippines (Glick 1999). Masked by these great macro-economic indicators were overheated[4]

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[1] A financial crisis is an economic shock to the financial markets that disrupts the ability of the market to allocate capital efficiently (Corsetti, Pesenti and Roubini 1999). The term financial crisis is loosely used to denote a combination of banking, debt or a foreign exchange crisis. The term is usually used to refer to the 'big one' ...: a generalized, international financial crisis that is a combination of foreign exchange market failure, debt default, and banking system crisis: a triple crisis in which their interactions are the key to depth, intensity and persistence (Eichengreen and Portes 1987).

[2] A currency crisis arises when a country with a loosely pegged or fixed exchange rate runs a cumulative current account deficit (when imports exceed exports of goods and services), that can no longer be funded by inflows of foreign capital (required to cover the gap in foreign exchange) in the form of debt, direct and portfolio investment (Lim 1999).

[3] "Pure contagion involves changes in expectation that are not related to changes in a country's macroeconomic fundamentals. Spillovers, on the other hand result from interdependence among developing countries themselves" (Masson 1999 p.267).

[4] Overheating refers to the excessive expansion of aggregate demand (Lopez-Mejia 1999).

economies characterized by cumulative current account (CAB) deficits, capital account (KAB) surpluses and high international reserves (Ir) that caused a positive income-effect.

The inability to predict the Asian crisis by the international financial institutions such as IMF and WB as well as academic scholars in all relevant sciences was mainly because the crisis did not exhibit similar symptoms to previous balance of payment and currency crises. Neither did the macroeconomic indicators of the East Asian economies prior to the crisis resemble those preceding the Latin American or Mexican 1994 crisis.

On one hand, the period before the Latin American crisis was characterized by a period of relatively high and possibly accelerating inflation, and excessive budget deficits financed by the central banks printing of money. In a fixed exchange rate regime, high inflation rates reduce competitiveness, erode the international reserves and create a balance of payment deficits. On the other hand, East Asian countries had very low inflation rates and high international reserves funded by capital inflows. Government expenditure was kept to a minimal one-digit percentage of GDP and GDP per capita growth rates were quite high. These differences in the events preceding the two regions' crises may have been the reason the East Asian crisis caught everyone by surprise. Even during and after the crisis, the differences between the two regional crises were not perceived.

> "The IMF approach [to the crisis] suggested that it was unable to distinguish Indonesia's [and other East Asian countries] problems from the balance of payment crises suffered by other countries in the past" (McLeod 1999, p.222).

This may have been due to some similarities in macroeconomic activities between Latin America and East Asian prior to a crisis. These activities include high capital inflows attracted to high investment returns in these developing regions, pegged exchange rate regimes, improper use of fiscal and monetary policies to control and direct the capital flows and the final massive capital reversals that trigger a full fledged crisis.

Numerous approaches and attempts to predict a crisis have been made in the past with few, if any, successes in identifying an approach that may be efficient enough or close to the mark in forecasting out of sample crisis. The approach of formulating and estimating models using data from crisis periods to obtain parameter estimates and prediction factors is an ex-post crisis analysis approach and is, therefore, inadequate in predicting future crises (Berg and Pattillo 1999). It is however quite efficient in determining the dynamic causal relationships before, during and after a crisis. The 1998 KLR (Kaminsky, Lizondo, and Reinhart) prediction model is based on monitoring indicators to determine whether they cross a certain set threshold. The BP-Probit based models are still being refined and tested to determine their efficiency levels.

My research objective is to attempt to predict a crisis in East Africa by obtaining parameter estimates of modeled macroeconomic and balance of payment relationships of the East Asian regions before and after the crisis. These parameters are compared with those obtained by the regression of similar relationships for the East African region with an attempt to determine similarities in parameter estimates from the two regions.

1.1 Justification of the Study

"Capital inflows are motivated by the opportunity to exploit a government subsidy and ability of the government to give away free money" (Dooley 1999, p.113). In his study, Dooley (1999) summarized that widespread response to Capital inflows has been as official intervention in foreign exchange rate markets and increases in international reserves. The inflows that occurred prior to the Asian financial crisis were encouraged by central banks efforts in the East Asian region to limit the exchange rate changes against the U.S. Dollar. This effectively absorbed the perceived risk of exchange rate movements on behalf of investors (Glick 1999).

Encouraged by high interest rates and crawling or loosely pegged exchange rates, the high capital inflows caused an expanding financial market bubble in the East Asian economy. The internal balance was maintained at the expense of a distorted external balance. These distortions put a lot of pressure on the economy and led to an "overheated economy" characterized by inflationary pressures, appreciated exchange rates and widening current account deficits.

South East Asian export boom began having problems in mid 1990s due to the appreciation of the U.S. Dollar against the Japanese yen (SE Asian's biggest trading partner), the devaluation of China's Renminbi and the development of NAFTA.

As East Asian exports demand reduced with diminishing world demand (World Bank 1998) productivity of the Asian countries declined causing reduced returns on foreign investments. "Thailand was the first country in Southeast Asia to experience virtually zero growth in export markets, signaling to speculators the vulnerability of the

Thai foreign exchange reserves that had been dependent on foreign borrowings rather than on foreign trade earnings" (Jackson 1999, p.8). With the onset of the market recession and diminishing investment returns, investors started to respond to the financial market signals by withdrawing their capital. Distorted foreign currency prices that were mismatched with the market forces put a lot of pressure on the governments to inject money into the economy to fund the capital outflows. The currency crisis intensified as the perception that the exchange rate was misaligned amplified the investors concern and increased the demand for foreign currency leading to the floating of exchange rates and a full blown Asian financial crisis.

Herd behavior would have been minimized or the rate of flight reduced if the Thai exchange rate and other loosely pegged currencies of the Asian region had been allowed to devalue with each market signal prior to and during the onset of the financial crisis. Under the pegged exchange rate regime, the economy was unable to undergo market discipline and therefore the capital account inflows escalated unchecked. Adoption of flexible exchange rate regime supported by macro-economic policies would have slowed down the economies and prevented the expanding current account deficits and money savings in form of foreign reserves at the expense of the high capital inflows. Though adjusting to flexible exchange rates is the widely recommended remedy, there has been some success in the use of a combination of exchange rate and macro-economic policies in curbing financial crisis in Developing Countries (DCs). The use of a mix of foreign currency market intervention, sterilization effects, artificial exchange rate appreciation,

and investment restrictions on non-residents', would have been successful in preventing the buildup of speculative capital in East Asian prior to the crisis (Dooley 1999).

This study focuses on the causal effects of exchange rate regime and interest rates on each other and their effects on the balance of payment components. It will show that the government intervention in the exchange rates market with the aim of controlling appreciation of the domestic currency led to an increase in international.

> "Under *laissez-faire*, higher capital inflows (in response to attractive domestic investment opportunities) tend to cause an exchange rate appreciation. But the government [Indonesian] was concerned that this would have a negative impact on exports, and so chose to intervene in the foreign exchange market as a buyer to prevent this appreciation from occurring. To offset the expansionary monetary impact due to its intervention, it had to borrow from the public by way of issuing central bank certificates of deposit" (McLeod 1999, p.234).

The distorted macroeconomic prices did not allow the economy to adjust for declines in the rate of investment returns. On the contrary, the steadily managed exchange rate depreciation gave a false assurance to investors who did not see the need to hedge against a predictable exchange rate backed implicitly by high international reserves (Aghevli 1999). They invested heavily in projects with low returns since the exchange rate risk was assumed away. A more flexible exchange rate policy would have eliminated the one-way bet that may have encouraged excessive reliance on foreign financing.

1.2 Empirical Analysis

This empirical study is done in two parts. The first part attempts to determine the contribution of the East Asian region exchange rate regimes and differential interest rates on the massive capital flows, the overheating economies and the Asian financial crisis. The second part is a comparative analysis of the macroeconomics between the East Asian and East African select countries. Panel analysis of the effects of the real exchange rate and differential interest rates on the balance of payments sub accounts of the two regions is done and the parameter estimates obtained from the analysis compared for similarities or structural changes using Chow's test. The financial crisis and the comparison analysis procedures are described below.

1.2.1 Analysis of the Financial Crisis

In the first part of this thesis, an empirical analysis of the economic events during and prior to the 1997 financial crisis will be carried out to provide an indication of the macro-economic circumstances that may have led to the crisis. Since a country's economic transactions are recorded in the balance of payment accounts, granger causality effects of the real exchange rate and the differential interest rates on the balance of payment sub accounts will be done to determine the dynamic causal relationship between these variables. Three dynamic relationships will be tested. The first relationship is between the East Asian countries real exchange rates and relevant balance of payment sub accounts. Basically, real exchange rates tend to have a positive effect on the balance of trade and current accounts. The statistical significance of the estimated parameters will

indicate whether the exchange rate regime was influential in the economic changes before and during the crisis.

The second analysis will test for the dynamic relationship between the exchange rates regimes and monetary policies of the economies under study. Governments control the domestic money market through their central bank credit and their international reserves. Money supply is mainly through the sale or purchase of bonds, changes in the international reserves, and printing notes. (Rivera-Batiz and Rivera-Batiz 1994). By controlling the money supply, governments can influence via market forces, what foreign currency is worth per domestic currency. The East Asian economies implemented monetary policies as a means to support their fixed or loosely pegged exchange rate regimes and maintain capital inflows. By increasing interest rates through the sale of bonds, central bank increased capital investment returns and reduced demand on foreign currency. This test will reproduce the interest-exchange rate nexus results from the analysis done by (Basurto and Ghosh 2000).

Thirdly, the effects of interest rates on the balance of payment components will indicate whether the monetary policies implemented were instrumental in attracting massive capital inflows that fueled the overheated economies. The causal effect of the differential interest rates on the capital account and financial account will be determined. It is expected that the fluctuations in the interest rates caused the adjustments in exchange rates and capital inflows while the changes in exchange rate caused changes in the balance of trade and foreign reserves.

1.2.2 Comparison Analysis

The second part of the analysis is a comparative analysis of annual panel data of East Asian economies and the East African economies from 1985 to 1998. This analysis assumes that the countries within each region experienced similar macroeconomics shocks and market forces. The reason that Panel analysis is done is due to the deficiency of quarterly data for the East African countries.

Generally, the models formulated from the Mundell-Fleming model will be used in this analysis and the same relationships as the first part of the analysis will be tested in the two sets of Panel data. There will be no need for unit root and co-integration tests since the data is pooled. A simple ARDL model will be used. The parameter estimated in the panel analysis for the East African and East Asian countries will be compared to determine whether a similarity in the effects of the real exchange rate and differential interest rates on the balance of payment sub accounts exists in the two regions.

1.3 Organization of Study

Chapter two consists of a broad literature review. It is divided into four parts. The first part is a description of the economic development over the last fifteen years of the East Asian countries; Indonesia, Korea, Malaysia, Thailand and Philippines. The second part is a similar economic review of the East African countries, which are Kenya, Tanzania and Uganda. The period of focus will also be the last fifteen years. Key economic indicators such as GDP per capita, inflation rates and growth rates will be mentioned. The history of capital flows and the exchange rate, monetary and fiscal policies will also be included, providing the foundation required for interpreting and

understanding the empirical analysis. The third part will review the events of the East Asian financial crisis narrated for the purpose of this study.

The last part will be a summary of past empirical studies done on the 1997 financial crisis that have significance for my analysis. Numerous IMF economists have done empirical studies on aspects that they perceive as reasons for the financial crisis. There are similarities in the empirical studies and certain models are constantly used with small alterations. On the other hand, there are certain aspects that have not yet been directly studied such as the direct effects of the exchange rate on the capital inflows, international reserves and debt service. Certain models and methodologies used in some of the past analysis will be modified and used in this analysis while others are relationships created specifically for this research from macroeconomics identities and theories. These models will be discussed in details under the theoretical modeling techniques in chapter three.

Chapter three explains the procedure for defining the eight models used in studying the East Asian economies. First, the balance of payments sub-accounts are identified and their relations to the overall Balance of payments are discussed. The Mundell-Fleming model, an analytical model based on the Keynesian approach to economics and developed by economists Robert Mundell of Colombia University and Marcus Fleming of the IMF will be used to describe the determinants of the balance of payments sub accounts. The Mundell-Fleming model is modified to yield relations for each balance of payment sub accounts regression with the exchange rate and interest rates (Rivera-Batiz and Rivera-Batiz 1994). The time series data will then be defined and

tested to determine if it is stationary. This chapter includes a description of the Dickey-Fuller (DF) test for non-stationarity and the Johansen and Engel Granger co-integration tests to be carried out in the data analysis. Models will then be formulated from the identities described in the Mundell-Fleming model and from the data generating process (d.g.p.). Just as in the past empirical studies, this study identifies the variables as time series data and has used auto-regressive distribution lags (ADL), vector auto-regression (VAR) or Error Correction models (ECM) models to determine granger causality effects. Granger causality analysis provides a means of determining the dynamic relationship between the balance of payment components and exchange rate regime without having a specific functional relationship between the variables. The ADL, VAR, ECM, granger causality test, t-statistic and F-statistic will be discussed briefly in this chapter. The panel analysis modeling and estimation will also be discussed.

Chapter four will give a description of the data used in this study and transformations carried out on it before running regressions on the models. Granger causality test on the East Asian variable, quarterly data from 1981:1 to 1999:3 (IMF various years) will be used to determine the events prior to and during the financial crisis. The five East Asian countries' to be studied will be Indonesia, Korea, Malaysia, Thailand and Philippines and the East African countries in the comparative analysis will be Kenya, Uganda and Tanzania. The results of the empirical analysis of the financial crisis and that of the panel data comparative analysis will be presented.

The hypotheses established in chapter three will be tested and the overall results discussed in chapter five. The East Asian and East African regression results and parameter estimates will be compared to determine a trend between them.

Chapter six summarizes the test results and discusses if the results obtained were in agreement with hypothesized expectations. Also, to be considered is whether the possible occurrence of an East African crisis can be predicted using the analytical framework as a basis.

CHAPTER 2

LITERATURE REVIEW

2.1 An Overview of the East Asian Economies

East Asia's achievement in improving the living standard of its people is amazing. The region succeeded in converting its high growth rates into better infrastructure, increased jobs, and productivity and social welfare. The number of people living below international poverty line of USD 1 a day declined from 720 million to 350 million, reducing the number of people living in poverty by half in the last 20 years (World Bank 1998). The GDP per Capita of the five Asian countries increased slowly in the 1970s and began accelerating in the 1980s reaching their peak before the East Asian financial crisis in 1996. Korea, the only Northeast Asian country in this study, has maintained the highest GDP and GNP per Capita since 1970 followed by Malaysia, Thailand, Philippines and, finally, Indonesia. This is illustrated in the table below.

Table 2.1, GDP and GNP per Capita Means for the Five Asian Countries; 1970 – 1998

	GDP per Capita	GNP Per Capita
Indonesia	500.44	472.24
Korea	3,669.74	3,644.29
Malaysia	2,055.21	1,952.38
Philippines	604.54	608.25
Thailand	1,089.28	1,003.00

Source: Data analysis of IMF-International Financial Statistics, various years

In 1996, all the East Asian countries experienced their highest GDP per capita ever with Korea having a GDP per capita of US$ 10,885.17. Korea was the front runner of the Asian economic miracle; this was evident in its population's high standard of living.

Table 2.2, Maximum values for GDP and GNP per Capita for the Five Asian Countries; 1970 – 1998

	GDP per Capita	GNP Per Capita
Indonesia	1,135.54	1,043.45
Korea	10,885.17	10,849.51
Malaysia	4,882.18	4,655.11
Philippines	1,149.09	1,196.40
Thailand	3,051.93	2,975.20

Source: Data analysis of IMF-International Financial Statistics, various years

The economic growth in the East Asian countries had been an incredible two digit number from the 1970s to the mid 1990s with the exception of the period between 1980 and 1985 when there was reduced growth due to the international debt crisis. On the average, growth in the East Asian countries was between 8.1083 percent recorded by Philippines and 17.38 percent by Indonesia. During the recession periods of 1980 to 1985, there was reduced growth for all the East Asian countries ranging from –2.85 percent to 8.4 percent. All the countries were able to rise above this economic hardship but only Korea and Thailand were able to experience double digit growth figures after 1984. This is illustrated in the table below.

Table 2.3, GDP per Capita growth of the five Asian Countries over the period specified.

Average	Korea	Indonesia	Malaysia	Philippines	Thailand
1971-1984	16.9%	17.3%	12.9%	8.1%	10.7%
1980-1984	8.3%	2.2%	3.2%	-2.8%	2.5%
1985-1993	17.2%	6.8%	7.9%	7.5%	13.9%
1985-1995	15.8%	7.7%	8.7%	7.4%	13.4%
1996-1998	-4.9%	-13.6%	-13.9%	-9.0%	-10.4%

Source: Data analysis of IMF-International Financial Statistics, various years

These countries kept their inflation low, invested in human capital, encouraged savings, restricted price distortions, encouraged adaptation of foreign technology and avoided any hindrances on agricultural development. Most of the Association of East

Asian Nations (ASEAN) adapted a nominal anchor policy by pegging loosely to the U.S. Dollar. They were characterized by high interest rates due to their implementation of tight monetary policies to sterilize capital inflows. These policies unfortunately led to a perverse effect as the high interest rates attracted more capital flows with 60 percent of all short-term capital flows to developing countries ending up in East Asia.

During the 1997 financial crisis, the East Asian countries' GDP per capita growth was in the negatives with a growth reduction of over 20 percent. The event of each of the five Asian Countries economic events prior, during and after the financial crisis is explained below.

2.1.1 THAILAND - Economic Events

Thailand moved from the cultivation and export of raw material to their processing and export making it the worlds' fastest growing economy between 1985 and 1995 (Doner and Ramsay 1999). By 1992, the Thai economy was considerably diversified in agriculture, service and manufacturing activities. This happened through a set of institutional arrangements initialized by Field Marshal Sarit Thanarat who came to power in 1958 with the aim of revolutionizing the economic growth process in Thailand. He gave control of macroeconomic stability and policies to technocrats with the understanding that they would not interfere with sectoral and microeconomic mismanagement that benefited the political masters. This arrangement maintained macroeconomic stability by achieving low inflation, tightly managed budget constraints for private sector, and stable exchange rates. It also gave the vulnerable Chinese

entrepreneurs assurance of economic stability. Joint ventures with foreign firms were created promoting the foreign investment environment. Sarit had established the Board of Investments (BoI) to promote investment in Thailand granting a wide range of tax and tariff exemptions to promote exports. This resulted in a high level of protectionism that was counteracted by the increase in comparative advantage. Thai firms had a comparative advantage in labor intensive products such as garments but relied highly on foreign investments in industries for its exports while still allowing most domestic oriented producers to enjoy protectionism. A dualism production structure in electronics, textile and motor vehicles was prominent in Thailand with domestic investors mainly producing for domestic markets while foreign affiliated firms producing mainly for export (Doner and Ramsay 1999). The foreign affiliated firms grew bigger and became less dependent on patronage, fostering competition for clientele. Because power to grant permits and licenses was scattered through out the government bureaucracy, firms could adjust themselves into different functions to obtain support needed by different ministries. This form of clientelism and corruption in Thailand tended to expand rather than restrict new investment opportunities. Imports substituting industries grew in Thailand in the 1960's when the BoI was vested with the power to grant firms a wide range or taxes and tariffs as well as prevent government competition. Overall tariffs increased in the 70s and 80s even as export incentives were given to firms in order to curb balance of payment experienced in early 1970s. Despite these high taxes and tariffs, the economy grew due to competitive advantage, institutional arrangements, and export oriented protectionism.

The devaluation of the Thai bhat in 1984 gave Thai exports a cost advantage. State officials and agents typically worked with private sectors to resolve issues especially issues important to export. The Bangkok bank was used to resolve agricultural exports and textile industry collection problems.

Between 1988 and 1995, Thailand's exports grew by 28 percent per year, but this reduced to zero in 1996 due to a decrease in world demand, appreciation of the baht, high domestic inflation and high interest rates. Increased wages in labor intensive industries and increased competition from other developing countries were the main reasons for the decline in export growth. "Between 1982 and 1994, Thai real wages increased by 70 percent" (Doney and Ramsay 1999, p.176).

It is felt that protectionism and politically powerful import competing sectors cannot be blamed for inefficient growth because they did not cause inefficiency in South Korea and Taiwan, which also practiced protectionism. Government agents responsible for directing economic growth were more interested in the gains from taxes and tariffs. There was a lack of support for vertical integration and technological advancement of domestic, labor intensive industries such as the textile industry. Foreign affiliates were able to vertically integrate funded by foreign capital as well as obtain government support through the exports oriented protectionism. The labor-intensive exports became vulnerable from competition from neighboring developing countries. This coupled with reduced world demand led to poor economic performance. By 1996, Thailand had a current account deficit of 8 percent GDP. Export stagnation, low returns and poor performing loans triggered a warning sign to foreign investors. By November 1996, the

Thai baht was under heavy speculative attack. The Bank of Thailand attempted to defend the exchange rate and stabilize the economy by using up its international reserves until July 2nd 1997 when the Thai baht was floated.

2.1.2 INDONESIA – Economic Events

Indonesia's economy performed very well prior to the crisis with a growth rate of 8 percent per annum, a decrease in inflation by about 9 percent per annum and exchange rate depreciation at a managed 4 percent per annum (McLeod 1999). Indonesia has had a slowly increasing GDP per Capita with the highest being US$ 1135.5 experienced in 1996. The GDP per Capita growth between 1985 and 1996 inclusive was 7.76 percent after which Indonesia experienced negative GDP per capita growth of -13.7 percent during the financial crisis. Among the five affected East Asian countries, it has had the lowest GDP per capita over the years.

Since the 1980s, Indonesia had large international reserves and balance of payments surpluses. High foreign debt may have been the only abnormal macroeconomic situation but this was not deemed a problem since repayment commitments were met as expected enhancing confidence in this form of financing. Due to the experienced continual high growth rates, businesses and investment projects were analyzed and financed with high optimism as expectations of growth in the future were never expected to be any different from the past 20 to 30 years.

Though Indonesia had exemplary macroeconomic performance, its microeconomic activities were frequently a state of concern. Though tariffs and import

restrictions had been reduced significantly, the Indonesian government's strategy on development served the interests of a narrow elite rather than the general public. The microeconomic activities were run by conglomerates closely linked to the first family and their close associates who gained favor and easy access to funds with little or no competition. They basically owned all the important and large businesses from distribution of fertilizer to peasant farmers, to exclusive rights to the 'manufacture' of what was later to be identified as 'Korean cars'. The Busang[5] gives an indication of the extent of business hoaxes. Another problem was government spending outside the formal budget that went into financing politicians private businesses. Headed by Soeharto's longest serving Minister of Research and Technology and Head of Agency for Management of Strategic Industries, Dr. B. J. Habibie, private businesses were escalated into highly technical developmental projects run by the government. The projects either lacked strong demand, highly skilled labors, or just failed to interest potential shareholders. These projects included jet aircraft projects, bridges across Indonesia's islands, ships, motorcars manufacture and power generation using nuclear fuel (Mcleod 1999).

The impact of these microeconomic activities on the crisis was not clear since there seemed to be no prior event of this nature that could have been of a magnitude high enough to cause a lack of confidence in the rupeeh. It is felt that the costs of these activities may have been built into the firms product pricing and high-expected returns

[5] The Busang gold discovery in Indonesia -- touted by Canada's Bre-X Minerals Ltd as the richest find of the century -- was falsified on a scale "without precedent in the history of mining" (Schuettler 1997). Many investors lost their money in this investment that falsely claimed a source of gold in Indonesia containing 71 million ounces of gold.

A sudden awareness of exchange risks in the presence of this long booming bubble could have triggered off the crisis, especially, after the float of the Thai bhat and the unhedged foreign debt and portfolio investment (McLeod 1999).

When the Thai baht was devalued on July 2nd, the rupeeh came under heavy speculative attack. The government decided against playing the speculative game and floated the exchange rate on August 14th preventing a great loss in international reserves. This caused an explosive devaluation of the Rupee by 95.1 percent in 1997 and 72.6 percent in 1998[6]. With the stabilizing of the Asian economy, the Rupee appreciated by -11.713 percent in 1999.

A severe liquidity squeeze was implemented in a bid to stabilize the economy. This policy had been used before in 1984, 1987 and 1991 only this time the crisis lasted for weeks and not days. This indirect influence on exchange rates through the money market showed that the government had not fully embraced the idea of a free-floating exchange rate. Interest rates peaked in 1998 with discount rates at 38.4 percent, money market rates at 62.8 percent and lending rates at 32.15 percent. This was in great contrast to the interest rates before the crisis. Between 1986 and 1996, the lending rate maintained a stable rate ranging between 17.7 and 21 percent with a mean of 21.25 percent.

Businesses highly financed on foreign debt faced high interest rates obligations. The government also decided to cut expenditures though it did so, on future, rather than present projects affecting the current budget.

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[6] All percentages are obtained from the analysis of IMF-IFS data for various years.

The IMF assistance package was finally announced in October though the effect of this perceived government guarantee did not last long when investors discovered the lack of effectiveness of the pledges. The exchange rate continued to depreciate and went as high as Rp 6,000 when concerns of the President's poor health after he failed to attend two overseas meetings, affected the economy. IMF assistance was estimated between USD 18 – 41 billion with Singapore offering USD 18 billion, the same amount as IMF though IMF's funds were to be spread over a period of months. IMF funds were also conditional on Indonesia's government implementing certain micro-economic changes and attaining a budget surplus of 1 percent of GDP (McLeod 1999). The money given to Indonesia was not initially planned for and was taken more as assurance to speculators that there was money to back up their investments. At one time, it was suggested the money be used as a means to bail out businesses that were running bankrupt but the idea was quickly shelved after complaints that these were…."special privileges to those already fabulously wealthy at the expense of the general public" (McLeod 1999, p.212). The government did not want to commit itself to more debt in the name of playing the speculator's game and the IMF stand-by-loans became an impotent gesture to countries experiencing the crisis. The IMF macroeconomic policies of fiscal and monetary tightening implemented in November and December also proved to be counter-productive by increasing unemployment, low agricultural wages and low consumer demand.

Reforms undertaken by the government to stabilize the economy included liberalizing tariffs and closure of sixteen poorly run banks, some belonging to members

of the first family. Another 240 banks seemed to have similar problems and closing all these banks was not going to solve the problem. In light of this, the government announced it would not close any more banks and kept this promise for 3 months. State banks were taken over by government agents to try and recover what they could from them. The government later announced issuing more bonds to keep the banks functional. This prevented the total collapse of the banking systems and regained some investor confidence in the financial system.

2.1.3 KOREA – Economic Events

It was not expected that the crisis would spill over to Korea even after the Thai bhat float. "Neither models based on 'economic fundamentals' nor models based on 'sunspots' succeeded in predicting the contagion effects of the crisis to Northeast Asia" (Pyo 1999, p.164). South Korea, which had often been referred to as the model economy or front-runner of the 'Asian Miracle" was the hardest hit in Northeast Asia. Most of Korea's development can be attributed to its' institutionalized corporate firms which traded a lot of their products internationally. Government control of monopolistic competition created conglomerates known as *Chaebol*s that were too large and influential to fail, leading to business entities characterized by very high debt-equity ratio. The rapid export-led growth created an upper class that demanded more democracy and transparency as well as better social amenities such as schools and higher environmental standards leading to massive investment in social infrastructure and non-tradable goods.

> "In January 1992, foreigners were allowed to invest in Korean stocks subject to a limit of 20 percent of any one company's total outstanding shares to all foreign investors and 3 percent to a single investor. In July 1994, foreigners could directly purchase convertible bonds subject to a 30 percent aggregate ceiling for total foreign investment and a 5 percent investment ceiling" (Pyo 1999, p.157).

The first signs of trouble in South Korea began in 1994 when stock prices index fell from a high of 1027.4 in 1994 to 882.9 in 1995. The high current account deficits were due to the depreciation of the Japanese yen with respect to the U.S. Dollar. High competition from China and the rapid integration of Korea into the WTO caused changes in comparative advantage that led to changes in the export oriented trade. When Korea's economy began slowing down, some of the corporate firms began reflecting poor returns and eventually declared bankruptcy, leading to capital flight (Pyo 1999).

South Korea's financial crisis is seen as a result of astounding amounts of short-term debt obligation. "Korea's total foreign debt outstanding as of December 29th 1997 was USD 153 billion composed of USD 80.2 billion in short term debt with maturity of less than one year and USD 72.8 billion in long term debt" (Pyo 1999, p.153).

South Korea was offered a bailout assistance package of USD 57 billion by the international financial institutions, which was USD 5 billion bigger than the rescue package of Mexico in 1995. This was because Korea had been a model for the 'Asian Miracle' with good economic performance. If the crisis was to be stopped, IMF decided it would stop it in Korea. The announcement of the bailout did not reverse the flight of foreign capital. "As much as USD 1 billion was flowing out of South Korea per day in December 1997" (Pyo 1999, p.152). The IMF programs to South Korea were intended to

reduce current account deficits to below 1 percent of GDP in 1998 and 1999, contain inflation and stabilize the economy. South Korea managed to follow these recommendations closely for the first four months by creating committees made up of government officials, business leaders and labor unions to come up with a consensus on reform measures. It took the swapping of short-term debt with long-term debt backed by government guarantees to finally stop the capital flight.

Korea's limited openness of its stock and bond markets and its flexible exchange rate system based on a major-currency basket reduced the impact of speculative attack of its currency by foreign investors. Even this partially flexible exchange rate system was not sufficient in stabilizing the foreign currency exchange market (Pyo 1999).

2.1.4 PHILIPPINES – Economic Events

Philippines crisis was a mix of political uncertainty and economic outcomes giving rise to a 'crisis of confidence' (Montes 1999, p.242). Philippines was in the middle of a political crisis when the financial crisis erupted. Supporters of President Fidel Ramos were in the middle of attaining signatures that would vote him back into his second term in office, by popular vote, contrary to the constitution. Anti-dictatorship demonstrations in the streets and the fall in stock prices and domestic currency halted this process. With his statement on 21st September 1997, President Ramos ended the constitutional crisis and decided not to vie for presidency.

Philippines, just like Thailand and Indonesia had undergone a financial and capital flows liberalization phase. A series of crises in Philippines had led to the

tightening of monetary policies with the aim of preventing future crises. A major balance of payment crisis had occurred in 1949 (which saw the establishment of a central bank), 1962 (lead to dismantle of import quota systems) and in 1970 (saw fiscal tightening by authoritarian experience as a means to prevent government). A Banks crisis occurred in 1981 while from 1984 to 1985, a balance of payment crisis occurred due to the international debt crisis. Post martial law during President Ferdinand Marco's reign influenced economic recovery in 1987-1988 (Montes 1999).

Due to these periods of crisis, Philippines' banks had become highly conservative. Interest rate restrictions, heavy reserve requirements (20 percent deposit), severe entry barriers and restrictions were imposed on banks. In 1983, Philippines undertook quite orthodox reforms, becoming the first country in Asia to remove interest rate restriction completely. Banks were privatized and restrictions on specialization by function removed. Joint ventures between foreign and local banking groups were promoted creating clubs. This led to high interest rates as the banks tried to increase profits. Banks blamed the high interest rates on exchange rate risk and intermediation cost.

Exchange controls had been dismantled and mutual fund investments permitted in Philippines by September 1992. Capital mobility liberalization was in its advanced stage when the crisis occurred. At the onset of the financial crisis, banks in Philippines were relatively stable though the outstanding loans of commercial banks had increased through the years from 25.4 percent in 1994 to 51.9 percent in 1996. These loans were characterized by high short-term portfolio flows. Because of the late bank liberalization, the lending boom had been limited to 1996 and the conservative nature of the banks from

their previous experiences and increased supervision reduced high leverage lending and poor financial management.

2.1.5 MALAYSIA – Economic Events

Malaysia is a member of the ASEAN and just like the other nations in the association, had trade ties with Japan and other Asian countries. Its largest export market though is America. With the setting up of NAFTA, the export market to American was reduced prior to the crisis. This coupled with the low world demand caused investment returns to reduce leading to poor performing investments highly dependent on short term loans.

As with Indonesia, Chinese businesspersons were not made welcome in Malaysia. Prior to the crisis, the Malay collaborated with foreigners in order to bypass the Chinese to avoid dependence on them. The result of this was to limit Chinese investment in easy-to-exit activities. Malaysia attempted to curtail Chinese investment through restrictive licenses, protective tariffs, ownership limitation, preferential credit allocation and outright ban on Chinese activities in certain sectors (Woo-Cumings 1999). The Chinese responded by obtaining patrons and sponsors from within for their investments.

With the onset of the crisis, the Prime Minister, Mahathir, played to domestic nationalist and religious sentiment by speaking against international Jews and foreign investors. This caused panic in the economy and accelerated capital outflows. Prior to the crisis, Malaysia had established cronyesque ties between business and political leaders through the co-operation of the ruling party, United Malay National Organization

(UMNO) and New Economic Policy (NEP). Because Prime Minister Mahathir wanted to maintain this socioeconomic arrangement, he rejected IMF funds. He instead implemented tighter exchange rate and capital controls.

On September 1st, Malaysia fixed it's previously market determined exchange rate, at RM 3.8 per U.S. Dollar, an appreciation of 10 percent. The following day, it set up capital controls. The implementation of hard core Keynesian management helped the economy survive the crisis (Woo-Cumings 1999).

2.2 An Overview of the East African Community

The East African region (Tanzania, Kenya, and Uganda) covers an area of 1.8 million squared kilometers with an aggregate population of 80 million, who share common history and language - Kiswahili. This region has great potential for natural resources in minerals, water, energy, and wildlife. It is also has well-developed agricultural, livestock and tourism industries.

The East African Community (EAC) integration, aborted in 1977 after 10 years, was inaugurated again with the signing of the EAC treaty on November 30th 1999. The objectives of the new trading region are to incorporate the economic development policies of the three countries in areas concerning market, private sector and liberalization by pooling together their resources and through their free trade promotion programs. Kenya is the more competitive economy, exporting about two thirds of its goods to Uganda and Tanzania. "The EAC is expected to present a good investment platform for both domestic and foreign investors due to their economies of scale" (African Business Pages 2001, p.1).

Opportunities for investors exist in service, trade and tourism sectors. The government specifically promotes investments in agriculture; especially in horticulture, fishing, industry, manufacturing, mining in; gold, diamond, copper, titanium, soda ash and gas. The EAC member states are also members of the common market for East and Southern Africa (COMESA), South African Development Community (SADC), Inter-governmental Authority on Development (IGAD) and ACPEU trading arrangements, making the EAC a central location for Sub-Saharan trade in manufactured goods. The regional policy framework strives to maintain macro-economic stability and privatization of public services in telecommunication and electricity in order to service the region well in order to combine comparative advantage (Tanzania High Commission 2001). Each country's economic events are discussed below.

2.2.1 KENYA – Economic Events

Kenya, a previous British colony gained its independence on December 12th 1963. Agriculture is the main economic activity accounting for 25 percent of GDP. Coffee, tea and tourism are the main foreign exchange earners. Kenya has undergone various economic phases since its independence. Low inflation, high employment creation and stable balance of payment position characterized the first 10 years. During this period, its GDP grew at 6.5 percent per annum (Central Bureau of Statistics - Kenya 1993).

The second phase (1973-1980) saw Kenya's economy suffer major shocks. The 1973 oil price increases caused internal and external economic dis-equilibrium but this period was followed by a rise in coffee and tea prices between 1977 and 1978 that improved the balance of payments. Up to 1974, Kenya's shilling was pegged to the U.S.

Dollar. The exchange rate was changed from a peg to the U.S. Dollar to a peg to the sDR (special Drawing Rights) in 1974. Erratic foreign exchange fluctuations and large exchange rate devaluation characterized this regime which also contributed to the increased balance of payments. Unfortunately, oil prices increased again in 1979 causing economic setbacks. Even then, Kenya maintained a positive GDP growth of 5.2 percent. Kenya's GDP per Capita had been growing steadily since its independence in 1964 with a peak of USD 360.95 in 1980.

The third phase (1980 – 1985) is characterized by slow GDP growth (2.5 percent per annum) due to the high oil prices and a global recession (1980-82). Export market shares reduced as the expansion in exports by most African countries increased the world supply of primary commodities (coffee, cotton, and sugar among others). This decline in its market shares and export prices reduced the export revenues of SSA from 7 percent before the 1970s to 4 percent between 1970 and 1985 (Njoroge 1993). The 1984 drought made the economic situation worse. In a bid to stabilize the exchange rate, the peg to sDR regime was replaced by a crawling peg regime in 1982.

Phase four, which began in 1986, saw government implementations of the structural adjustment plans (SAPs) in Agriculture, trade and Industry. From 1985-96, Kenya's GDP per capita had an average growth of 1.8 percent fluctuating between a minimum of –36.06 percent experienced in 1992 and a maximum of 21.54 percent observed in 1994. During this period, the government steadily depleted its international reserves from USD 390,647,000 in 1985 to USD 116,939,000 in 1991. The crawling peg regime was phased into a dual exchange rate regime in 1990 to control the foreign

exchange and slow down or prevent the depletion of the international reserves. The economy's attractiveness to foreign investment after 1989 declined as indicated by a decrease in the financial account balance, which registered its first deficit in 1992. This implied that all capital outflows from short-term investments in bonds, stocks portfolio and private investments exceeded all capital inflows. In late October 1993, the Kenya shilling was allowed to float in order to prevent a crisis after a series of devaluation. By floating the currency, the Kenyan government expected to have several advantages. First, the adjustment to demand and supply of foreign exchange become more continuous. Second, the government could control the domestic economy without directly influencing the international reserves. Third, monetary policies could be used without affecting the balance of payments (Ndungu 2000).

Since the exchange rate was floated in a period of high liquidity, massive exchange rate depreciation and increased inflation followed. The government increased its borrowing from the public to control inflation. As a result, Treasury rates escalated to such high levels that discount rates were pushed to their historical high, causing businesses to undergo a credit crunch. The Treasury bill rate had been increasing steadily over the years after independence. It reached its peak in 1993 with a rate of 49.8 percent due to increased government demand for money bidding up its price. The discount rate, which is determined by the Treasury bill rate, increased to 45.5 percent in 1993 and the lending rate reached its maximum ever in 1994 at 36.2 percent. Foreign capital inflows also increased slightly after 1992 from a dip of USD (-270,107,000) as the high Treasury bill rates and discount rates began attracting speculative money again. In 1994, the

government expenditure/borrowing was so high that it experienced its first highest budget deficit ever of USD 26,811,000,000. This was also the election year.

The exchange rate bid up to a peak of Ksh68.161 per U.S. Dollar at the end of 1993 as demand for foreign currency increased with the increased political risk, as another election year approached, causing an outflow of speculative money. Capital flight by both domestic and foreign investors was common in Kenya as political uncertainty hung over the election period. As the 1994 elections neared, the financial balance reduced slightly. The financial account balance has since then fluctuated over the years with a general increasing trend. Due to the highly depreciated exchange rate, the balance of payment increased reflecting higher returns from exports and decreased investment in imports. The current account balance for the first and only time had a surplus in 1993 and 1994. As the exchange rate depreciated to its lowest value ever in 1993, Ksh.68.1 per U.S. Dollar, the balance of payments also registered its highest surpluses of USD 422,824,000 in the same year.

With the end of the election year, the interest rates decreased and speculative money began to flow out. This is indicated by the negative financial deficits in 1995. When the exchange rate appreciated in 1994 the balance of trade deficit in goods, services and income rose as imports versus exports increased with the appreciated exchange rate. The government increased its international reserves and had a Budget surplus in 1995 and 1996. Kenya's economy highly depends on IMF and EU funding. In the previous years, IMF has cut its funding due to high corruption and mismanagement of funds. Negotiations between IMF and Kenya based on the Interim Poverty Reduction

Strategy paper and Ministerial Rationalization Exercises are still underway. Kenya is still in the process of privatization of state owned firms, fiscal contraction measures and combating corruption by setting up public sector reforms.

2.2.2 TANZANIA – Economic Events

The United republic of Tanzania is the biggest country in East Africa. It hosts the great West and East Rift valley, the highest mountain in Africa (Mt. Kilimanjaro), part of Lake Victoria (the second largest lake in the world) and late Tanganyika (Africa's deepest and longest fresh water lake and the worlds second deepest). This illustrates the geographic diversity of Tanzania. Tanzania, former Tanganyika, gained its independence from Britain in 1961 and became a republic on December 2nd, 1962. Zanzibar gained its independence from the Sultanate to join Tanganyika and finally form the Republic of Tanzania on April 26th 1964 (Planning Commission - Tanzania 1996).

Agriculture plays a great role in Tanzania's economy contributing the highest share of GDP. In 1979, Tanzania's army helped overthrow President Idi Amin of Uganda, which was a success for Uganda but a financial blow to Tanzania's economy. Tanzania's highest GDP per capita occurred in 1982 with a peak of USD 336.0. Tanzania's economy until 1985 was a blend between socialism and 'Ujamaa' (Tanzania's community based development system) ideologies. Between 1985 and 1996, Tanzania's GDP per capita had a negative growth of –0.350 percent with a minimum of –32.2 percent in 1986 and a maximum of 23.15 percent in 1996. Its nominal exchange rate has

been depreciating since 1960s while its discount rates have remained relatively steady with slight increases in 1994 when the discount rate hit a maximum of 67.5 percent.

During the period when Tanzania's GDP per capital reduced, it experienced increased reductions in balance of trade, balance of payments and current account balance below the previous lows. The financial account balance has fluctuated over the years under study while the capital account balance has increased slightly remaining positive since 1990. The international reserves also increased steadily from 1985. This can be attributed to the economic wind of change that swept through Tanzania since 1986 where the Tanzania government started dismantling state economic controls and liberalizing economic regimes. In the late 1980s, Tanzania underwent political change, adapting a multiparty democracy in 1992.

In 1993, Tanzania became a member of the Enhanced Structural Adjustment Facility (ESAF) program. This program includes privatization of state owned enterprises, liberalization of the economy and reduced budget deficit among others (Travel Document Systems 2002).

2.2.3 UGANDA-Economic Events

Uganda attained its' independence on October 1962. Being landlocked, Uganda built a close economic relationship with Kenya and Tanzania. Uganda has a favorable tropical climate and its economy is prominently agricultural based with 90 percent of its population depending on subsistence farming and light agro-industries. Coffee, tea and

cotton are its main foreign exchange earners (Ministry of Finance and Economic Development - Uganda 1995).

Between 1962 and 1970, Uganda's economy flourished with a positive GDP per capita growth from the 1960s to the 1970s of about 5 percent per annum. This was due to expansion of the common market, reduced transportation costs and integration of banking facilities provided by the EAC. Unfortunately, Uganda's economy deteriorated under the rule of President Idi Amin from 1972 to 1979. The new nationalist, military government regime expelled foreign investment and undermined investor confidence in Uganda. The EAC was disbanded in 1977 and Tanzanian troops assisted in overthrowing President Idi Amin's government. Between 1979 and 1985, Uganda was faced with a period of civil war and military unrest that devastated the economy and social infrastructure. In 1980, Uganda experienced its highest GDP per capita value of USD 1,389.35 during President Milton Obote's rule after which it experienced negative growth up to 1984 due to a lack of foreign exchange and withdrawal of IMF support over a disagreement on budget policies. This was also a very trying period for agricultural exporters who at this time where experiencing reduced market share and export prices. Uganda was not spared even though its nominal exchange rate was highly undervalued.

Since 1986 however, the National Resistance Movement government has implemented recovery programs. In May 1987, a new Uganda shilling entered into circulation. Between 1985 and 1995, Uganda has had a fluctuating GDP per capita with a maximum growth of 51.5 percent in 1994 and a minimum of –31.3 percent in 1990. The average GDP per capita growth during that period was 4.36 percent. Uganda's BOT and

CAB have been on the decline between 1985 and 1998 even though the exchange rate had been increasing steadily with a peak of 1,217.15 Uganda shilling per USD in 1992. Uganda's anti-inflation package initiated in April 1992 achieved remarkable success when inflation decreased to below zero (after a high of 350% in 1986) by the end of 1992 (Uganda 2002). The Uganda shilling dropped back to 926.7 Uganda shillings per US$ in 1994 before continuing in its upward trend the following year. In 1994-1995, agricultural production increased by 7.1 percent with food crop production increasing by 7.7 percent per annum. Manufacturing sector grew by 17.7 percent in 1994-1995.

The financial account balance on the other hand had been positive from 1985 to 1998 indicating high capital inflows. Uganda had been dependent on foreign investments in a bid to restructure its war torn economy as supported by the positive capital account balance. Uganda's international reserves have also been on the rise as the government accumulated the excess foreign exchange brought about by increased financial assistance from IMF and World Bank. During the same period, the discount and Treasury bill rates increased to 13.5 percent in 1989 after which they started declining drastically to a low of 8.7 percent in 1995. Since then, the Treasury bill has stabilized about 7.7 percent and the discount rate at 15 percent.

An overview of the financial flows in Sub-Saharan Africa is discussed below to provide a basic understanding of the history, effects and types of capital flows that have contributed to economic development in East Africa. The contagion effects of the Asian Financial crisis in Africa are briefly discussed.

2.3 Capital Flows in Sub Saharan Africa

Sub-Saharan African economies have recorded a rise in real GDP growth over the years, reporting a real GDP growth of 4.5pecent between 1995 and1998 compared to 1.5 percent between 1990 and 1994. Annual inflation dropped to 10 percent in 1998 as compared to 48 percent in 1994 and the overall fiscal deficit fell from about 9 percent of GDP in 1992 to 5 percent in 1998 (Hernandez-Cata 1999). These growths are attributed mainly to the macroeconomic policies implemented by certain countries, which led to open markets and attracted capital flows. Sub Saharan Africa has been the largest recipient of official development finance receiving 26 percent of total official development finance worldwide between 1990 and 1995 with most of it in the form of either concessional or grant terms.

Private loans, portfolio equity flows and foreign direct investment have been significantly low with the majority of investors citing high political instability, poor foreign capital inflow policies and high impediments to exploitation of the opportunities in Africa. Due to the vulnerability of investments in Africa, contagion effects from the Mexican currency crisis caused a decline in capital flows to Africa. As a reaction to the requirements for Foreign Capital Investments (FCIs), virtually all stock markets have been opened to foreign investment and governments are reducing their influence in these markets allowing for market discipline to shape the economy. African oriented funds have also been formed to facilitate liquidity, incentive for privatization and increased portfolio investments in South Africa, Kenya, Botswana, Cote D'Ivore, Mauritius, Zambia and Zimbabwe. Generally, this should increase the Foreign Direct Investments

(FDIs) but there is a lot of guarded optimism and caution by investors as they perceive high risks in the unstable political, judiciary and economic system of these countries.

On the one hand, Private loans to Africa, and in particular the Sub-Saharan Countries have remained low if not negative. This is because most of the countries have not restored access to their financial markets and their credit worthiness has remained low given their debt burden. High political risk, weak growth, civil wars, macro economic instability and high indebtedness has given rise to the HIPC restricting bank lending, especially for public expenditure support.

On the other hand, Foreign Direct Investments for the non-CFA countries and the countries with a positive per capital income has increased since the 1980s. The returns for FDIs in the sub-Saharan between 1990 and 1994 averaged 24 to 30 percent compared to 16 to18 percent for all other developing countries (Bhattacharya, Montel, and Sharma 1997).

The major recipients of these foreign direct inflows (FDIs) can be grouped into three categories. The first long term recipients include Mauritius, Botswana, Swaziland, Seychelles and Zambia. These countries have had a long-term constant growth in FDIs. The second group includes countries that have recorded high FDIs mainly directed to mining and oil sectors such as Angola, Cameroon, Gabon, Guinea, Lesotho, Madagascar, Mozambique, Namibia, Zimbabwe and Nigeria. The final group is for countries that have had significant rises compared to low or declining FDIs in the early1980s. It includes countries that have undertaken macro-economic reforms, minimal regulations, open markets and minimal regulations on trade such as Uganda and Ghana among others.

In general, output growth, openness and stability of real effective exchange rates will be necessary for increased FDIs in the Sub-Saharan while low external debt and high investment returns will encourage foreign private loans. Certain countries have seen a rise in FDIs and private capital flows while the majority of the Sub-Saharan African countries are recipients of official development loans under the Structural adjustment plans program, Poverty reduction and Growth Facility as well as other traditional debt relief programs.

2.3.1 Effects of the Financial Crisis

The East Asian financial crisis led to a sharp decline in capital flows of long term debt to developing countries from USD 104.7 billion in 1998 to USD 44.7billion in 1999 with 1.3 billion of this coming from Sub Saharan Africa. Private flows fell by 10.8 percent while those from international capital markets plummeted by 55 percent in 1999. Equity investments to developing countries increased by 80 percent in 1999, though equity to Sub-Saharan Africa declined by USD 0.2 billion to 0.5 billion during the same period. Foreign Direct Investment (FDI) continues to be the most stable and largest component of total capital flow into emerging markets. FDI in agriculture in Sub Saharan Africa grew to about 1.5 percent of its GDP from 0.2 percent of GDP in 1992. Grants to Sub-Saharan Africa reduced due to the lightening of budgets in the donor countries while concurrently, official flows received by developing countries increased from USD 50.6 billion in 1998 to USD 52.0 billion in 1999. In 1999, net concessional finance to East

Asia, Middle East, North Africa and Latin America rose while allocations to Sub-Saharan Africa, Europe, Central and South Asia fell (Bank of Tanzania 2001).

2.4 The East Asian Financial Crisis

2.4.1 Setting the Stage

The formation of IMF was brought about by a widespread lack of confidence in paper money during and after the Great Depression that led countries to hoard gold and money that was easily converted to gold. International trade was disrupted as competitive devaluation took place, causing a reduction in prices of goods by 48 percent and value of international trade by 63 percent between 1929 and 1932 (IMF 1968). The IMF enabled unrestricted conversion[7] of one currency to another by having all countries define their money in terms of gold or U.S. dollar. This par value of trade kept currencies stable and predictable. Unfortunately, it had a whirl pool effect so that change in one major currency affected the whole system. 20 years later in the 1970s, the par value approach was abandoned, as the dollar became inadequate in meeting the demand for gold. The float system was adapted by many countries and proved to be a catalyst to global trade efficiency.

With the float system, countries were at liberty to decide what they wanted to peg their currency on and some pegged the value of their currency to other major currencies or group of currencies. This new market evolution became the ideal exchange policy to employ but in actual sense robbed countries of their "economic autonomy" (Adelman 1999).

Governments were no longer able to employ their traditional instruments (interest rates, government expenditure and exchange rate) to control the flow of capital and this triggered large Foreign Capital Investments (FCIs) setting the center stage for a potential financial crisis. This view is a major debate with some economists suggesting that currency controls may be desirable to control speculative currency attacks. The failure of the loosely pegged exchange rates in managing the capital flows should demonstrate the inefficiencies of these exchange rate policies. The East Asian countries chose to keep their exchange rate regimes loosely pegged or fixed to the U.S. Dollar in order to maintain some control of the capital flows but, which contrariwise created an incentive to the massive capital flows into their economies. Apparently, this policy did not deter the high, prolonged growth rate and technological returns observed in the Asian countries since the early 1980s as expected by its critics.

About USD 670 billion of foreign capital had flowed to developing countries in Asia and Latin America in the five years from 1990–94 compared to USD133 billion total in the five previous years (Calvo and Leiderman 1996). These massive capital inflows to developing countries were the result of the adoption of sound monetary and fiscal policies. The policies included liberalization of domestic capital market, open market trade, dis-inflationary programs as those implemented in Chile, Mexico and Bolivia in the 80s, and Peru, Brazil, Argentina and Ecuador in the 90s. The adoption of these policies increased investor confidence in the Least Developed Countries (LDCs) investments and attracted long term FDI. The decline of world interest rates (the U.S.

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[7] This refers to the ease with which one can buy foreign currency within a country

experiencing the lowest short-term rates in 1992 since 1960s) made investments in developing countries where, risks and returns were high, very attractive. The low world interest rates also decreased the credit worthiness and debt default of debtor countries that borrowed at those rates. Increased debtor-creditor relationships of LDCs and debt-equity swaps[8] also encouraged FDI.

Secondary market prices of bank claims rose and portfolio equity investment developed as the most mobile form of flows, causing commercial bank and portfolio investments to set the pace for FCIs. International diversification by insurance and mutual funds into LDCs markets increased driven by the recession in the U.S. and Europe in the 1990s. Trade grew by 5 percent between 1990 and 1997 while private capital flows grew by 30 percent annually (World Bank 1998) in developing countries.

The vulnerability and dynamic nature of the new global financial markets was evident with the Mexican currency crisis.[9] Although some contagion effects were felt in some developing countries faced by similar economic uncertainty, it did not stop the massive capital flows from finding new homes in Southeast Asian economies.

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[8] The essential transaction is that a debt claim on a country is swapped by that country's central bank for local currency claims that should be invested in local firms. They replace interest payments by dividend payments and are not a source of new money for the debtor country (Sachs 1989).

[9] The Mexican peso crisis of 1994 was a currency crisis that was preceded by high capital inflows followed by high capital reversals as speculator perception of investment returns changed.

2.4.2 Economic Events Prior to the Financial Crisis

The macroeconomic policies adapted by the Asian Countries to deal with the overheated capital inflows tightened monetary policies in an effort to sterilize inflows.[10] They curbed credit expansion, but increased domestic interest rates. These policies operated through institutions which kept the exchange rate stable and inflation low. Since the exchange rates were loosely pegged or fixed, exchange rate risk was perceived non-existent by these bank investors and foreign investors, encouraging unhedged external debt. The local currency was to a high degree hedged by foreign lender and investors but unhedged by banks, corporations and sometimes governments in Thailand, Korea, and Indonesia.

The exchange rate policies implemented were a major contributor to increased capital flows. Most of the ASEAN countries used the nominal anchor policy before the crisis occurred. These informal pegs to the U.S. dollar made the domestic currency more predictable and created large differentials between domestic and foreign rates, causing a real appreciation of the ASEAN currencies.

Between 1989 and 1992 the Asian countries relaxed controls on foreign capital flows as well as deregulated domestic interest rates (Corbett and Vine 1999). During this period, financial and capital liberalization backed by high economic growth resulted in increased capital flows in the 1990s.

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[10] This policy aims at insulating money supply and/or the exchange rate from the effects of capital inflows; the effect is to mitigate inflationary pressures, the real exchange rare appreciation and avoid loss of control over the domestic stock. It can be implemented by increasing the number of domestic bonds or by central banks raising bank reserves required, reducing the money base.

This led to the accumulation of a lot of foreign exchange reserves, which widened the current account deficits as the gap between national investment and savings, increased. Low world interest rates compared to the high developing country interest rates caused a positive income effect inducing increased consumption as people switched from traded to non-traded goods. The appreciated fixed exchange rate increased the value of imports while becoming a disincentive to domestic export production. Since most of the ASEAN countries traded significantly with Japan, as the yen depreciated prior to the crisis, the ASEAN currencies lost competitiveness with other yen markets.

The banking systems of the FCI recipient countries had become content and overly inadequate in handling the high masses of capital. In the years before the crisis, banks and non-banks borrowing in the affected countries grew rapidly, with the banks in each country increasing their foreign liabilities by large percentages. Total external indebtedness had exceeded 50 percent by mid-July 1997 in Thailand, Indonesia and Philippines (Jackson 1999). Foreign borrowing led to a domestic lending boom that fueled traditional banking practices, corporate familism and a tendency to follow investment fads rather than market demand. Over-capacity production especially in automobiles and real estates escalated, causing highly leveraged projects. As the world demand declined, the marginal capital inflows began to yield low returns. There was simply too much foreign money chasing few sound investments that were capable of earning foreign exchange sufficient to service the principal and interest debt. Instead of the banks exercising constraint on lending, they borrowed abroad to speculative investments in real estates or non-competitive enterprises such as petrochemicals and

steel. Short term capital lending was used to finance long run investments and therefore lead to highly leveraged investments and increased short-term debt to foreign reserves (an estimate of a country's ability to meet current obligations). Short-term money is "hot money" and will flow out as rapidly as it will flow in. Korea, Indonesia and Thailand had short-term debt to reserves ratio of over 150 percent while Malaysia and Philippines had less than 100 percent (World Bank 1998) by June 1997. Broad money (M2)-to-reserves ratio was also highly indicative of a possible run on the currency of the country with a pegged or fixed exchange rates by its citizens, in the event of a lose of confidence in their economy.

2.4.3 Onset of the Financial Crisis

By 1996, the world demand for Asian products, especially Japan and China (Corbett and Vine 1999) had declined so adversely that export growth contracted by 1 percent. The Japanese market (which was the major market for most Asian economy inputs) dropped sharply and prices of real assets stopped growing as a result of the devaluation of the yen against the U.S. Dollar. The oversupply of imports into the Asian economies from Western Europe, Japan and North America in the late 1990s lead to a foreign exchange dependence on foreign borrowing rather than on trade earnings. Loss of wage competitiveness coupled by appreciation made the situation worse in Indonesia. The declined demand for Asian goods led to declining investment returns. Domestic borrowers in Thailand began defaulting on their loans, causing investor confidence in the bank system to erode. Failure of the Asian banking sector and businesses to meet the

global standards, regarding financial regulation auditing and corporate governance (combined with the falling investment return) became critical in undermining investor confidence. Domestic investors began pulling out of the stock market when they observed that domestic companies had reduced returns and could not meet their financial obligations. Increases in non-performing loans curtailed the ability of banks to continue lending. These factors accelerated the capital flight in Indonesia, Malaysia, Thailand and Philippines once the foreign domestic investors sensed deep-rooted weaknesses in the financial sector. Thailand began to realize high asset prices and private capital inflows declined such that bond issues and syndicated loans fell by 30 percent (World Bank 1998) in the first half of 1997. Equity investors started to withdraw their investments as financial companies began to experience problems in early 1997.

The default of Somprasong Land[11] on a Eurobond issue in Thailand reduced the Asian economy credit worthiness and the reversal of capital flows became extreme. Thai's baht was chasing fewer and fewer dollars. In February 1997, the pegged exchange rate policy came under attack from the international finance organizations and Thailand's Central Bank. In defense, the government injected USD 23 billion into the economy only to have the dollars attacked by the high demand motivated by the pegged exchange regime. As the capital flight escalated, Thailand's government tried to supply the much-needed liquidity, but this was quickly absorbed.

Initially, the Thai governments used their international reserves to supply the foreign currency. Between May 1 and May 14, 1996, Thailand reserves had dropped from

[11] The first Thai land company to default on foreign debt in January 1997.

USD 24.3 billion to USD 2.5billion (Lissakers 1999). Devaluation of the exchange rate, as opposed to funding the capital flight, was the easier solution recommended by the international finance economists to bring the external balance into equilibrium. On July 2nd, the government due to pressure from financial organizations, and irrepressible market forces, succumbed and announced a managed float of the Thai exchange rate.

Given the events preceding the financial crisis and the unique similarity and dependency of the Asian countries, the devaluation of the Thai baht affected the whole region's economy. Masson (1999) identified three reasons as to why the currency crisis was regional. One is the monsoon effect where major economic shifts in industrialized countries trigger a crisis in emerging markets. The second is the spillover effect where macroeconomic fundamentals in an emerging market will affect those in another emerging market (usually through trade). The third is identified as contagion effects, which are changes in expectations not related to changes in an economy's macroeconomic fundamentals. As the East Asian financial crisis spread through spillover and contagion effects, investors in other related Asian economies began to withdraw their funds. The growth rates of the East Asian economies declined as economic recession began to set in.

The speed and rapidity of the international financial contagion caught everyone by surprise (Lissakers 1999). The interdependence and inter-linked financial system that led to substantial leaps in the development of ASEAN countries was also the flight route for high speed, brutal speculative money from areas of potential high risk.

2.4.4 Effects of the Financial Crisis

The collapse of the Thai baht caused investors to look more critically at the weaknesses they had previously ignored in the financial and banking system. Lack of transparency of financial systems and corporate firms with declining asset prices caused capital outflow in the other emerging economies. Spillover effects through financial links between the ASEAN countries made the situation worse.

The outflow of capital in 1997 caused surpluses in the current account balance as a result of import compression and reduced income. Private investment-savings balances underwent adjustment, reducing demand. Monetary and fiscal policies were tightened. Due to the fall in profits with the contracted trade and economy, corporate firms were unable to service their debt, and in turn, many banks became dysfunctional. Unemployment increased and social protests became common, causing pressure on governments to react. As a result, economic and political metamorphosis began taking place in the East Asian region. Asian Nationalists strongly voiced conspiracy theories where global capitalists were accused of using speculative tools to destroy all that Asia had built in the prior years. This is best illustrated by the statement made by Prime Minister of Mahathir of Malaysia on August 23rd 1997; "All these countries have spent 40 years to build up their economies and a moron like Soros[12] comes along" (Jackson 1999, p.2). Governments found their political legitimacy challenged and were confronted

[12] George Soros is a renounced Philanthropist, President and Chairman of Soros Fund Management LLC and manager of Quantum Endowment Fund, one of the most successful Investment funds with an average of 31 percent annual return over its 30 year history. Soros opinions on the Asian Financial Crisis contributed to massive capital flight out of the Asian regions, not mentioning the exchange of words with the Malaysian Prime Minister over the crisis.

by an increasing lack of tolerance for cronyism and familism by domestic investors. Within the first twelve months of the crisis, democratic as well as non-democratic governments were overthrown. Korea's former political prisoner extremist, Kim Dae Jung, ousted the ruling political party while in Thailand a new constitution and Chuan Leekpai's new government was installed in November 1997. Indonesia's President for thirty-two years, President Suharto resigned under pressure from student protesters and looting directed at Indonesian Chinese. In the Philippines, the successor of President Fidel Ramos was rejected and replaced by Joseph Estrada amidst protests by the influential Catholic Church and the elite. Japan's July 1998 upper house elections resulted in few Liberal Democratic Party (LDP) members in political power causing Prime Minister Ryutaro Hashimoto to resign (Jackson 1999).

Thailand, Korea, Indonesia and Malaysia went into deep recession and prospects of sharp economic contraction in 1998 (World Bank 1998).

2.5 Past Empirical Studies

The favored view by Asian policy makers on the causes of the Asian financial crisis is that the crisis happened because the market expected it to. They urged that the economies of the affected countries (Thailand, Indonesia, Korea, Philippines and Malaysia) were fundamentally sound, but at some point, speculators came to believe that the currencies would collapse. Investors refused to roll over loans denominated in these currencies, leading to massive drains in foreign exchange reserves. Speculators' beliefs became self-fulfilling prophecies.

The view that the Asian currency crisis was a coupling of equilibrium phenomena and self-fulfilling beliefs can also be theorized, though it provides only the historical events rather than any useful causes of the crisis.

Burnside, Eichenbaum and Rebelo (1999) chose to explain the causes of the crisis as fundamentally brought about by large prospective fiscal deficits stemming from implicit government guarantees to failing banking systems. They consider this approach a more promising alternative to the fundamentalist view. Large prospective fiscal deficits were the key factor behind the recent Asian currency crisis, since markets expected these prospective deficits would be financed at least, in part, by future seigniorage[13] revenues. So future, rather than past, monetary policy was the main culprit behind the crisis. To link the currency crisis to the banking crisis, they argue that the bank crisis caused a change in either past or future monetary policies.

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[13] The difference between the cost of the bullion plus minting expenses and the value as money of the pieces coined, constituting a source of government revenue; a profit from minting coins.

Burnside, Eichenbaum and Rebelo (1999) formalized the notion that expected changes in future monetary policy can cause a collapse in a fixed exchange rate regime and used Calvo's 1987 dynamics on speculative attack to explain this. They make three key assumptions. First, foreign reserves did not necessarily play a role in the time of the attack. Second, large losses in the banking sector were associated with a large rise in prospective deficits. Third, the market knew the banks were in trouble well before the currency crisis. Their model implies that the collapse of the fixed exchange rate happened after the agents learned that future deficits will rise but before the government implemented its new monetary policies.

Their work, being one of the latest empirical analyses on the causes of the financial crisis gives an insight into the effects of international reserves, budget deficits and banking crisis on the exchange rate regime. The intention of my analysis is to find out the granger causality effects of the exchange rate regime on the international reserves, the budget deficits, the current account, capital account and balance of trade account. It will show that the exchange rate regime and incomplete sterilization operations were the cause of the overheated economy and that the government maintained the pegged exchange rate as a bid to perpetuate the massive capital inflows. While the results of the empirical analysis by Burnside, Eichenbaum and Rebelo (1999) determine the trigger of the financial crisis, the goal of this study will be to analyze the factors that contributed to the crisis.

Other related models that give significant input into this analysis include Zhang's (1996) empirical study of the exchange value of the Renminbi and China's balance of

trade. The time series data test for unit root and co-integration will follow a similar procedure put forth by Zhang (1996). My empirical study will use "modern theory"[14] to analyze the granger causality effects of the balance of trade and the exchange rate in the same manner as Zhang used it. Zhang's model gives great weight to inter-temporal shocks and exogenous supply shocks in explaining trade imbalances. The modern theory enables the analysis of the effects of the movements of both the variables in the bi-variate model such that a change in one variable partly explains the change in the other variable. It also provides the determination of a bi-directional cause effect of the variables. Zhang determined that a bi-directional causal effect existed between the real exchange rate and the price variables implying the presence of a vicious circle hypothesis and rejecting the J-curve hypothesis.

Basurto and Ghosh (2000) in their IMF working paper analyzed their monetary models using the granger causality test to determine the nexus of the real exchange rates and the interest rates of three East Asian counties affected by the financial crisis. The model that they used in their empirical analysis will be similar to the model used in my study to determine the effects that the differential interest rate (representing the future expected monetary policies) will have on the real and nominal exchange rates in the selected East Asian countries. The main difference between his model and the presented theorized model is the assumption that the risk factor is incorporated in the error term such that this analysis will have two variables instead of three.

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[14] Discussed by Zhang (1996) where he cites Greenwood, 1984; Razin, 1984; McKinnon and Ohno, 1986.

Basurto and Ghosh (2000, p.17) summarizes that the pure monetary model seems to characterize movements of the East Asian exchange rates reasonably well, and provides a credible framework to control for direct impact of monetary aggregates on the exchange rate.

Paul Krugman (1993) in his essays of "What We Need to Know about the International Monetary System" supports the practical application of the Mundell-Fleming model in explaining financial crisis. He points out its deficiency as a theory and its failure to connect other parts of economic theory that are strongly supported by most economists. Even with this controversy, this model was able to explain the ERM September 1992 crisis very well. Though 'structuralists' have criticized the relationship between exchange rate and trade balance, other extreme macro-economists have taken the inter-temporal explanation more seriously (Krugman 1993). "In a way, it is remarkable that economists have made so little effort to integrate international trade and monetary economies" (Krugman 1993, p.9).

An approach that Krugman (1993) identifies as the best attempt so far in trying to integrate International trade and monetary economies is the Dornbusch-Fischer-Samuelson 1977 paper. He determines the fall out in this paper as its lack of dynamism in its Keynesian and Richardian models of trade and production. In his summary, Krugman shows the conventional wisdom that exchange rate adjustments help reconcile balance of payments targets where the use of targets is justified in the context of sticky nominal wages.

> "Once we try to get the realistic trade-off between internal and external balance into anything more complex than the Richardian model, we are immediately faced with the need to get into a lot of messy stuff. The simplicity of both the Mundell-Fleming model and the Dornbusch-Fischer-Samuelson models seems to get buried under a welter of details" (Krugman 1993, p.12).

Krugman (1993) concludes that the Modified Mundell-Fleming (MMF) analysis seems to be extremely useful because it appears to work in practice much better than it ought to work in the light of trade theory. There exists a lack of consistency between international trade and the models used to analyze trading economies when macroeconomics is brought into the picture. The MMF seems to perform beyond this.

The empirical models created in this study between the exchange rate and balance of payment components is an effort to examine the events of the East Asian financial crisis based on the Modified Mundell-Fleming approach. Since the MMF worked significantly well in explaining the ERM crisis, it should consequently be able to explain the macroeconomics of the East Asian crisis within a granger causality model permitting for inter-temporal analysis of the variables. The modeling framework in my analysis will be consistent with the above mentioned previous studies. This study's analytical framework will resemble the procedures used by Chou and Chao (2001) in determining the effect of real exchange rates in aggregate output (GDP). The theoretical modeling process and resulting models are explained in chapter three.

CHAPTER 3

THEORETICAL FRAMEWORK

3.1 The Balance of Payments and the Mundell-Fleming Model

A country's balance of payment (BOP) accounts is a summary of its economic activities with the outside world. It is determined by two main sub accounts; the capital account balance (KAB) and the current account balance (CAB). Basically, transactions in the current account are income related flows while transactions in the capital account are asset-related flows (Kenen 1994). The current account balance reports all economic transactions in goods, services and investment income, taking into account the unilateral transfers (UT). Unilateral transfers are international transactions that do not involve exchange of goods, services and assets. These transfers include grants such as foreign aid, gifts, pension checks and any other transaction of this nature that is not a trade transaction. As their names suggest, they represent redistribution of income (Kenen 1994). Transactions in goods, services and income are recorded in the trade balance (BOT) sub account. The capital account balance (KAB) on the other hand registers all international asset transactions excluding those made by monetary authorities in assets serving as international reserves. The international assets registered in the capital account (KAB) include foreign bonds, stocks, banking transactions such as CDs and treasury bills. Any foreign central bank transactions in these assets are not included as part of the capital account since they are considered transactions affecting the official international reserves (Ir).

To isolate the short and long run investment capital flows for research purposes, the notation $(KKAB)$ will represent capital investments made in fixed assets while the financial account balance (FIN) will represent the investments in financial assets as recorded in the International Financial Statistics so that $KAB - KKAB = FIN$. When the balance of payment is positive, it implies that the sum of the current account, financial account and capital account balances are positive, while if their sum is negative, the balance of payments will be negative. Therefore a balance of payment records an excess of payments over receipts of the country's economic transactions with the world. An open economy will finance these deficits from its domestic production, international transactions, domestic savings and investments or its foreign capital and assets.

Under a fixed exchange rate regime, the balance of payment deficits are supported by changes in the official international reserves of central banks, ie $\Delta BOP = \Delta Ir$. On the other hand, under flexible exchange rate regime, monetary authorities do not have to worry about BOP problems because they are not required to intervene in the foreign exchange market. Any excess demand or supply of currencies will clear itself to set the market back to its external equilibrium. Therefore, there will be no changes in the foreign international reserves and the BOP will be zero.

$$BOP = CAB + KAB + \Delta IR = 0 \text{ and } \Delta IR = 0 \qquad (3.1)$$

The sum of changes in a country's official international reserve assets and in its official reserve assets of foreign countries is referred to as the official reserve settlement (ORS) balance. (Rivera-Batiz and Rivera-Batiz1994). Since the balance of payment deficit in a fixed exchange rate is financed by official international reserves (Ir), balances

of payment deficit correspond to deficits in the ORS. It also implies that summing up the CAB and KAB (both fixed asset and financial asset capital flows) gives the official reserve settlement balance (ORS).

$$ORS = BOP = CAB + KAB \qquad (3.2)$$

When a country's government chooses to direct economic growth or stabilize the economy (through monetary and/or fiscal policies), or when the central bank gets into international asset transactions, the BOP will comprise of CAB, KAB and changes in IR to keep it at zero (Rivera-Batiz and Rivera-Batiz 1994).

$$BOP = CAB + KAB + \Delta IR = 0 \text{ and } \Delta IR \neq 0 \qquad (3.3)$$

Central banks have a responsibility to regulate and control a country's economy. They can offset BOP surpluses or deficits by changing the money base (H), which is the sum of the changes in international reserves and/or changes in central bank credits (CBC). Changes in money base (H) determine the money supply (Ms) in an economy.

3.1.1 Perfect Capital Mobility and Flexible Exchange Rates

As previously mentioned, under perfect or near perfect capital mobility and flexible exchange rates, the government will not be faced with a BOP problem. Central bank will have no obligation to control money supply in an effort to influence international reserves, but will instead use monetary and fiscal policies. When monetary policy is implemented, the net effect alters the central bank's portfolio composition (increase credit but reduce international reserves) and domestic residents' portfolio (reduce holdings of domestic portfolios or reduce holdings of domestic Treasury bills but

increase holdings of foreign securities). Unfortunately, the use of Fiscal policies in adjusting BOP surpluses and deficits in economies with a flexible exchange rate system has been found to be ineffective (Rivera-Batiz and Rivera-Batiz 1994). An increase in budget deficit rate by the expansion of government spending increases the demand for domestic goods and increases the interest rates. This will cause a KAB surplus and currency appreciation as demand for domestic currency increases with increased domestic interest rates. An increase in import demand is induced while quantity of exports reduces, deteriorating the BOT. The increased income will eventually causes an increase in money base and eventually a decline in interest rates back to their original level.

3.1.2 Perfect Capital Mobility and Fixed /Pegged Exchange Rates

With a fixed or pegged exchange rate regime, the central bank has an incentive to intervene in a BOP deficit or surplus to prevent the adjustment towards external balance from occurring. External balance is attained at the cost of internal balance (reducing domestic output and employment). Thus the government will want to intervene to prevent BOP adjustment through recession. This means that central bank will induces a breakdown of the automatic mechanism of BOP adjustment by "The international design system," as labeled by Professor Robert Mundell of Columbia University. (Rivera-Batiz and Rivera-Batiz 1994). One of those interventions is the sterilization operation; interventions carried out by an economy's central bank to neutralize effects that its interventions in exchange rate have on the monetary base.

To illustrate, when an economy experiences a sharp reduction in productivity, an oversupply of domestic currency occurs, pushing interest rates down and triggering an offsetting operation where the private sector purchases more attractive foreign bonds. This causes a balance of payment deficit. To control this external disequilibrium, the government has to sell foreign exchange reserves to the public to meet the excess demand for foreign currency and prevent devaluation of the fixed or pegged currency. This reduces the money base $\Delta H = \Delta IR + \Delta CBC$ and will continue to, if central bank chooses not to intervene until the excess money supply is eliminated and the interest rates stabilize.

In a sterilization operation, the government can increase the domestic credit creation by the same amount of foreign exchange reserves depleted through buying back Treasury bonds in the open market. This increases the money base ΔH back to its original level so that the decreased international reserves ΔIR will be equal to the increase in central bank credit ΔCBC. The downward pressure on the interest rates will be stopped but the original excess money supply and balance deficit will still exist. The combination of the money base changes but the amount remains the same. The advantage of sterilization is that it prevents an external payment situation from affecting internal monetary and credit conditions. Unfortunately, it also keeps the economy in a short-run equilibrium instead of allowing it to adjust to the full external equilibrium thus the balance of payments still remains in deficit.

Central bank can chose to either allow the economy to self adjust by permitting the capital outflows or can maintain BOP deficits and extend the capital inflows by

sustaining the high interest rates through monetary policies. This will keep the economy in a series of short run equilibria. The economy will finally adjust back to a full equilibrium when the government runs down its foreign official reserves and is no longer capable of intervening in the economy. The depletion of the IR will imply an inability by the government to intervene in foreign exchange markets and maintain its commitments. This relates to what happened in the five tiger economies of East Asia during the financial crisis. The forced devaluation and foreign exchange crisis led to a severe dislocation of the economy's foreign trade and financial sector. Fixed or pegged exchange rates regimes in a perfect capital mobility market are therefore incapable of controlling massive, long run capital flows as they lead to a run down of foreign official reserves. The pegged exchange rates (just like the high interest rates) were an incentive for foreign capital inflows since they were assumed to have no exchange rate risk. This gave investors false security by indicating that the pegged exchange rates will never be floated.

This study is concerned with the analysis of the effects the exchange rate regime employed by the East Asian countries on the balance of payment component that could have given early warning signs of an on coming financial crisis. As previously explained, when a government attempts to prevent currency depreciation, it eventually exhausts its international reserves and its borrowing capacity becomes limited. When it is no longer able to defend a fixed parity because of the constraints on its actions, a balance of payment crisis occurs.

Balance of payments variables and models used in this analysis have the following characteristics. The changes in international reserves are a result of changes in both capital and current accounts due to capital flows. These capital flows were due to changes in productivity and real exchange rates over the years prior to the crisis. The changes in trade balance are representative of the changes in the current account since it is assumed that unilateral transfers are not affected by the price of foreign currency. It is also assumed that the demand for domestic currency will depend on the exchange rate and differential interest rates. The economy is in full production and has fully flexible prices and wages so that an internal balance can exist. The economy is small so that its financial and trading transactions will not affect the world interest rates and goods prices. In this study, (unless mentioned otherwise) the term long-run capital account balance $(KKAB)$ will refer to capital transfers linked to the acquisition of a fixed asset other than transfers related to debt forgiveness. Financial account (FIN) on the other hand will refer to the net sum of the balance of direct investment, portfolio investment and other investment transactions (IMF 1998). In formulating the models capital account (KAB) will be used to refer to the sum of the long-run capital account $(KKAB)$ and the financial account balance (FIN).

3.2 Modeling Framework

Since the balance of payments is equal to the sum of the trade balance and capital accounts, the determinants of these two in turn will influence the balance of payments (Rivera-Batiz and Rivera-Batiz 1994). I will use the standard Mundell-Fleming model to study the effects of exchange rates on the current account (balance of trade) and the interest rates on the capital account. An essential characteristic of the Mundell- Fleming model is that after a shock has occurred, endogenous variables change to re-equilibrate the supply and demand of foreign currency flowing through the balance of payments (Almekinders 1995). This provides the framework to analyze dynamic relationships between the balance of payment components and their determinants mainly exchange rates and interest rates.

3.2.1 Mundell-Fleming Model

The Mundell-Fleming model –'the working horse of traditional open economy macroeconomics' developed by Robert Mundell of Columbia University and Marcus Fleming of the IMF will be used to determine the effects of the real exchange rate on the balance of payment. The Mundell-Fleming model is based on a simple Keynesian approach where domestic output is determined by the aggregate demand for domestic goods. Aggregate demand is a function of income and relative prices where the national income y of an economy, known as GNP, is the value of all the final goods and services produced by a country's residents in a given period of time. (Rivera-Batiz and Rivera-Batiz 1994). There are four sources of demand (or internal absorption (A)) in an

economy; the internal absorption in consumption (C), government spending (G) and investment (I) and export demands (X). Domestic demand is satisfied through gross domestic output (Y – which is the real GDP) and supplemented by imports (M). At equilibrium, domestic supply is equal to domestic demand,

$$Y + M = C + G + I + X \tag{3.4a}$$

Aggregate demand by domestic residents, referred to as absorption, can be represented as $A = C + G + I$ so that (3.4b)

$$Y + M = A + X \tag{3.4c}$$

$Y = A + (X - M)$ where $(X - M)$ is the real balance of trade.(3.4d)

$$Y = A + (BOTR) \tag{3.4e}$$

3.3 The Models

3.3.1 Real Exchange Rates and the Balance of Trade

To determine the effect of the exchange rate on the balance of trade (BOT) the real exchange rate $(EXCHR)$ will be used to isolate inflationary effects from the analysis. A country's real exchange rate can be defined as the relative purchasing power of domestic output (Kenen 1994).

$$EXCHR = EXCHN * \left(\frac{P_w}{P_d} \right) \tag{3.5}$$

Where $(EXCHN)$ is the nominal exchange rate, p_d is the domestic consumer price index (CPI) and p_w is the world price index. The real exchange rate $(EXCHR)$ is the price of foreign goods in terms of domestic goods and is therefore the reciprocal of

the terms of trade (TOT). A change in the nominal exchange rate can affect the current account balance only by changing the real exchange rate (Kenen 1994). To show the effects of the real exchange rate, the real balance of trade $(BOTR)$ will be expanded to its fundamental components. The $(BOTR)$ is the difference between domestic exports and value of imports in terms of domestic goods. The domestic exports represent the foreign demand for these goods (X), which just like a demand function depends on the relative prices and income.

$$X = f(y, EXCHR) \tag{3.6a}$$

y is the foreign real income and $(EXCHR)$ is the real exchange rate representing the relative price of foreign goods in terms of domestic goods. An increase in foreign real income y has a positive effect on the amount of exports demanded while an increase (devaluation) in the $(EXCHR)$ will cause a switch in their spending out of foreign goods into domestic goods. This switch increases exports. The quantity of imports on the other hand represents the quantity of foreign goods demanded (M) by domestic residents.

$$M = f(Y, EXCHR) \tag{3.6b}$$

Y is the domestic real income and $(EXCHR)$ is the real exchange rate. An increase in domestic income has a positive effect on the quantity of imports demanded while an increase in the $(EXCHR)$ will switch domestic spending from more expensive foreign goods to relatively cheaper domestic goods. This switch reduces domestic imports (Rivera-Batiz and Rivera-Batiz 1994).

Substituting the above expressions, the real balance of trade is the value of exports less the value of imports. $BOTR = E(Y, EXCHR) - X(y, EXCHR)$, which can be reduced to $BOTR = f(Y, y, EXCHR)$. Expressed in the three trade balance determinants,

$$BOTR = T(y) - \alpha(Y) + \eta EXCHR \tag{3.7}$$

The above expression represents the three basic determinants of the balance of trade; foreign and domestic income and real exchange rate. $T(y)$ is the trade balance dependent on foreign income and is exogenously determined. The second term represents the trade balance, which is determined by the domestic income (GDP) with α as the marginal propensity to import and η shows the impact of changes in real exchange rate on the trade balance.

To study the effects of the real exchange rate change on the real balance of trade $(BOTR)$ in goods, services and investments, the above equation is differentiated with respect to $(EXCHR)$ such that

$$\frac{\Delta BOTR}{\Delta EXCHR} = \eta \tag{3.8a}$$

The effects of changes in the nominal exchange rate and on the nominal balance of trade $(BOTN)$ in goods, services and investments will also be determined by estimating the following parameter.

$$\frac{\Delta BOTN}{\Delta EXCHN} = \kappa . \tag{3.8b}$$

It is expected that if $\eta > 0$, then the Marshall - Lerner - Robinson condition that a depreciation or devaluation of a country's currency will improve its current account

balance if the sum of the price elasticity's of domestic and foreign demands for imports is larger than unity (Kenen 1994) will hold. The Marshall – Lerner condition tests the responsiveness of the demand for domestic exports and imports to domestic currency deprecation η. The condition that the sum of price elasticity of demand for exports to real domestic currency changes (L), and the price elasticity of demand for domestic imports to real domestic currency changes (P), should be more than unit should hold if α is to be positive. As illustrated below, (L) measures the percentage changes in exports due to a percent change in the relative price of foreign goods in terms of domestic goods while (P) measures the percentage changes in imports due to a percent change in the relative price of foreign goods in terms of domestic goods.

$$L = \left(\frac{\Delta X / X}{\Delta EXCHR / EXCHR} \right) \quad \text{and} \quad P = \left(\frac{\Delta M / M}{\Delta EXCHR / EXCHR} \right) \tag{3.9}$$

X and M represent exports and import quantities respectively. $L + P > 1$ condition should hold for the coefficient η to be positive. The marginal propensity to import parameter α should be positive. In this analysis, the effects of exchange rate in the quantity side of the trade balance will be assumed weak so that the J Curve effect will not be significant in this analysis. The first model will therefore be represented as

Model 1.a $\quad \Delta BOTR = \Delta EXCHNR$

Model 1.b $\quad \Delta BOT = \Delta EXCHN$

3.3.2 Interest Rates and Capital Account Balance

To analyze the effects the changes in capital account balances (KAB) have on the balance of payments (BOP), it is important to examine its determinants and how they affect the (BOP). Since the world interest rate is assumed exogenous, the domestic interest rate is the major determinant of the capital account. The (KAB) can also be expressed as a function of differential interest rate between the domestic interest rates (r) and the world interest rates (R) so that

$$(KAB) = k(r - R) \tag{3.10}$$

This can be expressed as $KAB = \beta(i)$, $i = (r - R)$ and represents the interest rate differentials. In a perfect or near perfect capital mobility, investors will rapidly obtain information on interest rates differences and take part in financial asset transactions to take advantage of the gains from the interest rate spreads. This will cause capital flow until arbitrage aligns the domestic and world interest rates. When $r > R$, there will be capital inflows of foreign funds into the economy. The interest rate differential is be represented as (i) and $KAB = \beta(i)$ where β is a positive parameter representing sensitivity of the capital account to changes in domestic interest rates related to world interest rates. This defines the second model, which determines how differential interest rates affect the capital account balance (KAB) and consequently the balance of payment (BOP). The effects of differential interest rates on the financial asset capital flows and fixed asset capital flows will be isolated as below.

Model 2.a $\quad \Delta KKAB = \beta^{1}{}_{ik}(i)$

Model 2.b $\quad \Delta FIN = \beta^{2}{}_{ik}(i)$

3.3.3 Real Exchange Rates, Interest Rates and the Balance of Payments

As shown in the first model, the trade balance can be expressed as a function of foreign and domestic income and the real exchange rate, while the capital account presented in the second model, is a function of differential interest rates

$$BOTR = T(Y) - \alpha(y) + \eta EXCHNR \tag{3.11}$$

$$KAB = \beta(i) \text{ where } i = (r - R) \tag{3.12}$$

The balance of payment equilibrium equation expressed by the determinants of its components, (KAB) and (BOT) becomes

$$BOP = T(Y) - \alpha(y) + \eta EXCHNR + \beta(i) \tag{3.12}$$

The formalized framework of the (BOP) equation as per Mundell-Fleming model indicates that the overall balance of payments is a function of relative GDP and the real exchange rate - affecting the current account – and of the interest rates differentials - affecting the capital account. Assuming that the exchange rate is fully flexible means that the left-hand side of the above equation is zero (Radaelli 1995). In this study, the exchange rate is pegged and therefore the overall balance of payments is not zero. To determine the effects of changes in the real exchange rate and interest rate differentials on the (BOP) under pegged exchange rates regime, the following static analysis becomes our fourth model.

Model 3.a $\quad \Delta BOP = \Delta EXCHNR + \Delta(i) \mid \Delta(Y) = \Delta(y) = 0.$

It is important to analyze the direct effects of interest rates and exchange rates on the international reserves using the following model.

Model 3.b $\quad \Delta IR = \Delta EXCHNR + \Delta(i) \mid \Delta(Y) = \Delta(y) = 0$

3.3.4 Fiscal Policy, Interest Rates and Real Exchange Rates

In most developing countries, public external borrowing is a major source of government revenue. In fact, increased public borrowing has been linked to reduction of private borrowing even in cases of high interest rates. While government is borrowing excessively, domestic residents continue to invest their savings abroad thus implying that external debt finances private sector capital flight. This was the main reason behind the Mexican, Argentinean and Venezuelan crises (Rivera-Batiz and Rivera-Batiz 1994). An increase in government expenditure relates to increases in taxes, which causes capital flight to safer havens.

To illustrate, the good market equilibrium as indicated by the Mundell-Fleming model, can be reduced to $Y = A - (X - M)$. The real trade balance and income absorption can be expanded to their basic determinants such that

$$A = \bar{A} + \alpha Y - \beta(i) \text{ and} \tag{3.13}$$

$$T = \bar{T} - mY + \phi EXCHR . \tag{3.14}$$

$\bar{A}$ denotes autonomous absorption (representing the portion of absorption that is independent of income and interest rates and includes government spending $(\bar{G})$. i is the domestic interest rate, q is the real exchange rate and $(\bar{T})$ is the autonomous trade balance (independent of Y and real exchange rate) (Rivera-Batiz and Rivera-Batiz 1994). Solving for income yields,

$$Y = \alpha(\bar{A} + \bar{T} - \beta(i) + \phi EXCHNR) \tag{3.15}$$

$\alpha = {}^{1}\!/_{s+m}$ and is the open economy Keynesian multiplier. But

$$\alpha\Delta\bar{A} = \alpha(\beta(i) - \phi EXCHR - \bar{T}) - \Delta Y \tag{3.16}$$

Isolating government spending in $\bar{A}$,

$$\Delta(EXPN + e_t) = \alpha(\beta(i) - \Delta\phi EXCHR - \Delta\bar{T}) - \Delta Y + e_t \tag{3.17}$$

To determine the relationship between government spending and interest rates and exchange rates, the following model will be used.

Model 4.a $\quad \Delta EXPN = \lambda(i) - \partial EXCHR + e_t \mid \Delta\bar{T} = \Delta Y = 0$

The Mundell-Fleming model predicts that increased government spending will generate capital inflows and appreciate domestic currency. It will result in higher interest rates and incomes deteriorate the BOT but improve the capital account (KAB) mobility. The short-run capital inflows represented in the financial account balance will be used in this regression. The relative strength of each of the sub account effects will determine which sub account dominates (Rivera-Batiz and Rivera-Batiz 1994). To determine this, the following model will be used.

Model 4.b $\quad \Delta EXPN = \Delta FIN + \Delta BOT$

3.3.5 Monetary Approach to Exchange Rate Determination

3.3.5.1 Exchange Rates and Interest Rates

In the BOP model $BOP = T(y) - \alpha(Y) + \eta EXCHR + \rho(x)$ is tested for statistical significance. In the event that it is significantly positive, then it implies that deviations in KAB have a positive effect on the BOP. To determine whether depreciation of the exchange rate has a significant effect on the KAB, its effect on the interest rate differentials will be estimated using the monetary approach to exchange rate determination. The monetary approach to exchange rate determination implies that changes in the nominal exchange rate are determined by expectations of future discounted monetary policies (Basurto and Ghosh 2000).

$$i = (r - R) \tag{3.18}$$

This concept is best understood by the following underlying concepts of the monetary theory. The exchange rate is the price of foreign currency in terms of domestic currency, therefore the forces of market demand and supply determine it. Since this relative price is determined by two monies, the equilibrium relative price should satisfy the Walrus law which states that market demand should equal market supply. The individual money market equilibria of the two money markets are represented as;

$$\frac{M}{P} = L(r,Y) \quad \text{and} \quad \frac{M^*}{P^*} = L^*(R,y). \tag{3.19}$$

$\frac{M}{P}$ is the real money supply and $L(r,Y)$ represents the money demand being a function of real interest rate and real income. The absolute Purchasing Power Parity (PPP) relationship which states the equality between domestic prices P and foreign prices

P^* converted into domestic prices. $P = EXCHN * P^*$ will link the two demand functions. The absolute (PPP) assumes that the real exchange rate cannot deviate significantly from equilibrium (although it may change exogenously). Getting the ratio of the foreign prices (expressed in domestic currency) to domestic prices, we get

$$EXCHR = EXCHN\, {}^{P^*}\!/_{P} \text{ where } (EXCHR) \text{ can be 1 or 0.} \tag{3.20}$$

$$(EXCHR) > 1 \text{ if } P < EXCHN * P^* \text{ and} \tag{3.20a}$$

$$(EXCHR) < 1 \text{ if } P > EXCHN * P^*. \tag{3.20b}$$

Therefore $(EXCHR) = (EXCHN) * {}^{P^*}\!/_{P}$ is the real exchange rate. (3.21)

Domestic and foreign interest rates are linked by the interest parity condition where

$$\hat{EXCHN} = \hat{P} - \hat{P}^* + EXCHR \tag{3.22}$$

expressed in terms of proportional changes represent domestic $\hat{P} = (\hat{M} - \hat{L})$ and foreign $\hat{P}^* = (\hat{M}^* - \hat{L}^*)$ inflation. This can be expanded to

$$\hat{EXCHN} = (\hat{M} - \hat{M}^*) + (\hat{L}^* - \hat{L}) \tag{3.23}$$

where $(\hat{M} - \hat{M}^*)$ is the relative money supply and $(\hat{L}^* - \hat{L})$ is the relative money demand, a function of relative interest and income. Thus expanding $(\hat{L}^* - \hat{L})$ into the interest and income components, the above expression becomes

$$\hat{EXCHN} = (\hat{M} - \hat{M}^*) + \theta(\hat{Y} - Y^*) + \lambda(r - R) + \hat{EXCHR}. \tag{3.24}$$

This expression implies that changes in money supply and changes in money demand determine changes in the exchange rate. Changes in money supply reflect a country's monetary policies and changes in money demand reflect differential changes in the interest rates and income.

Changing this expression by using the uncovered interest parity,

$$(r_t - R_t) = (\hat{M}^* - \hat{M}) + \theta(\hat{Y}^* - \hat{Y}) + EXCHN_{(t+1)} - EXCHN_t = i \tag{3.25}$$

This implies that interest rate differentials are determined by anticipated exchange rate changes ignoring the risk primia (Rivera-Batiz and Rivera-Batiz 1994). Since the real exchange rate $(EXCHR) = (EXCHN) * P^*/P$ and the relative PPP does not hold i.e.

$(\hat{EXCHR} \neq 0)$, then the above expression becomes

$$\hat{EXCHN} = \hat{EXCHR} - [(\hat{M} - \hat{M}^*) + \theta(\hat{Y} - \hat{Y}^*) + \lambda(r - R)] \tag{3.26}$$

$$\text{where } \hat{EXCHR} = EXCHR_{t+1} - EXCHR_t \tag{3.27}$$

$$\hat{EXCHN} = (\hat{M}^* - \hat{M}) + \theta(\hat{Y}^* - \hat{Y}) + (r - R) + EXCHR_{(t+1)} - EXCHR_t \tag{3.28}$$

$\hat{EXCHR} = [(\hat{M} - \hat{M}^*) + \theta(\hat{Y} - \hat{Y}^*) + \lambda(r - R)] + \hat{EXCHN}$ and can be expressed as

$\hat{EXCHR} = (r - R) + \pi$ where π the error term includes the risk premium, monetary policy and nominal exchange rate effects. The above expression can be expressed as

$$EXCHR_{(t+1)} - EXCHR_t = \hat{i}_{t+1} + \pi_{t+1} \tag{3.29}$$

The changes in the real exchange rate embody all the expected future discounted monetary policies plus a risk associated with inflation differentials. Therefore the changes

in lagged exchange rates and interest differentials determine nominal exchange rate changes.

Model 5 will be $\Delta EXCH_t = \Delta EXCH_{t(-1)} + \Delta i_{t(-1)} + \pi$

To determine the granger causal direction of the real exchange rate and interest rate differentials (x), the following regressions will be run; (Basurto and Ghosh 2000)

Model 5.a $\Delta EXCHR_t = \Delta EXCHR_{t(-1)} + \Delta i_{t(-1)} + \pi_{11}$

Model 5.b $\Delta i_t = \Delta EXCHR_{t(-1)} + \Delta i_{t(-1)} + \pi_{12}$

This will determine whether the lagged interest rate differential changes caused changes in the nominal exchange rate.

3.4 Summary of Models

The following are the models that will be estimated in this analysis.

The granger causality effects of changes in the real balance of trade and real exchange rate

Model 1.a $\Delta BOTR = \Delta EXCHNR$

The granger causality effects of changes in the balance of trade and nominal exchange rate

Model 1.b $\Delta BOT = \Delta EXCHN$

The granger causality effects of changes in the capital accounts and differential interest rates

Model 2.a $\Delta KKAB = \beta_{Kt}(i)$

Model 2.b $\Delta FIN = \beta_{2k}(i)$

The granger causality effects of changes in the balance of payments, real exchange rate and differential interest rates

Model 3.a $\Delta BOP = \Delta EXCHNR + \Delta(i) \mid \Delta(Y) = \Delta(y) = 0.$

The granger causality effects of changes in international reserves, exchange rates and differential interest rates

Model 3.b $\Delta IR = \Delta EXCHNR + \Delta(i) \mid \Delta(Y) = \Delta(y) = 0$

The granger causality effects of changes in government expenditure, differential interest rates and real exchange rates holding domestic income and autonomous trade constant

Model 4.a $\Delta EXPN = \lambda(i) - \partial EXCHR + e_t \mid \Delta \bar{T} = \Delta Y = 0$

The causality effects of government expenditure, the financial accounts and balance of trade

Model 4.b $\Delta EXPN = \Delta FIN + \Delta BOT$

The real exchange rate-differential interest rate nexus

Model 5.a $\Delta EXCHR_t = \Delta EXCHR_{t(-1)} + \Delta i_{t(-1)} + \pi_{11}$

Model 5.b $\Delta i_t = \Delta EXCHR_{t(-1)} + \Delta i_{t(-1)} + \pi_{12}$

Below are the detailed hypothesis tests, empirical analysis procedure, data tests, data transformation and modeling techniques.

3.5 Hypothesis Study

This study will determine whether the controlled depreciation in fixed exchange rates caused the increase in international reserves, encouraging a build-up of cumulative current account and budget deficits over the years prior to the crisis. This created an overheated economy characterized by long-term investments that were financed by high foreign short-term debt. The realization by investors that foreign currency and money market prices were mismatched with their expected rates of return and that export growth was on the decline led to massive capital outflows. These capital flows contributed to a currency crisis that spread into the financial market, eventually escalating into an economic crisis characterized by recession, high unemployment and low growth rates.

After the float of the exchange rates in 1997, the trade balance increased as a result of the decline in import volume and an increase in export values. The first model tests the granger causality effect between the changes in the real balance of trade and the changes in the real exchange rates in Indonesia, Thailand, Malaysia, Philippines and Korea before and after the crisis. The hypothesis that exchange rate depreciation has a positive effect on the trade balance after the crisis and a negative effect before the crisis will be tested using the following model.

Model 1.a $\Delta BOTR = \Delta EXCHNR$

The granger causality effects of changes in the nominal balance of trade and exchange rate will also be tested.

Model 1.b $\Delta BOT = \Delta EXCHN$

Prior to the crisis, the government prevented exchange rate appreciation by participating as a buyer in the foreign exchange market. To offset the monetary expansion its intervention had created, it borrowed from the public, raising interest rates and driving private businesses into higher debt. These interest rates continued to attract capital inflows into the banking sector and investments with high returns. The relationship between interest rates and capital inflows will be analyzed. While a significant relationship is expected before the crisis, it is believed that, the increase in the domestic interest rates, as a means to control capital outflows during and after the crisis did not induce any response. Financial accounts (FIN) and overall balance of payments (BOP) accounts were also not significantly affected, indicating a lack of efficiency in the sterilization process by the Central Bank during the crisis. Model two (a) will test the granger causality effects of changes in differential interest rates on the changes in financial accounts.

Model 2.a $\Delta FIN = \beta^{F}{}_{ik}(i)$

Model 2.b $\Delta FLOWS = \beta^{Fl}{}_{ik}(i)$

Granger effects of changes in differential rates on capital inflows and outflows will also be tested in model 2.b.

To test the granger causality effects of variation in the balance of payments, real exchange rate and differential interest rates, the following model will be estimated.

Model 3.a $\Delta BOP = \Delta EXCHNR + \Delta(i) \mid \Delta(Y) = \Delta(y) = 0.$

Since increased capital inflows corresponded to an increase in international reserves a rise in interest rates as an incentive for capital inflows should cause an increase

in the international reserves and a decrease in the overall balance of payments. Thus the effect of interest rates on the balance of payments will be opposite in sign to its effect on international reserves. During and after the crisis, massive capital outflows depleted the international reserves causing an increase in balance of payment deficits. The model below will be used to determine the granger causality effects of changes in international reserves, exchange rates and differential interest rates

Model 3.b $\Delta IR = \Delta EXCHNR + \Delta(i) \mid \Delta(Y) = \Delta(y) = 0$

Prior to the exchange rate depreciation, governments borrowed from the public in order to induce monetary contraction as a counteraction to its intervention in the exchange rate market. The increase in government expenditure caused an increase in interest rates while the managed depreciation of exchange rate induced an increase in government expenditure as it absorbed the excess domestic currency. After the float of exchange rates, governments still attempted to indirectly influence the exchange market by using the money market. By increasing interest rates, it increased its spending and subsequently the exchange rate. The following model will be used to study the dynamic granger causality effects of changes in government expenditure, differential interest rates and real exchange rates holding domestic income and autonomous trade constant

Model 4.a $\Delta EXPN = \lambda(i) - \partial EXCHR + e_t \mid \Delta \bar{T} = \Delta Y = 0$

Governments also implemented liquidity squeeze as recommendation by IMF, in a bid to reduce their spending by privatizing their business institutions. Contraction of government expenditure was seen as a remedy by IMF though this has been recently

disputed for the East Asian situation where agricultural incomes, investment demands, consumer demand and demand for tradable goods were lows (McLeod 1999).

The main reason governments use exchange rate, monetary and fiscal policies is to control and direct economic development through intervention in the financial markets and international trade. The effects of government spending on the balance of trade will depend on how much its fiscal policies affect domestic production of exports. After the onset of the crisis, the balance of trade initially contracted with the loss in investor confidence but increased with the exchange rate depreciation. The effects of government spending on the financial balance will be dependent on how much the government relied on foreign capital inflows. The model below tests for the causality effects of government expenditure, the financial accounts and balance of trade.

Model 4.b $\Delta EXPN = \Delta FIN + \Delta BOT$

The relationship between the exchange rate and interest rate will show the degree to which increases in the interest rates by the central banks caused significant changes in the (controlled) exchange rates. Prior to the crisis, a rise in interest rates led to (a decrease) an appreciation of the real exchange rate while after the crisis, a rise in interest rates had no effect on the changes in exchange rate. Depreciation of the exchange rates reduced demand for domestic currency causing a fall in interest rates. This model tests the real exchange rate-differential interest rate nexus.

Model 5.a $\Delta EXCHR_t = \Delta EXCHR_{t(-1)} + \Delta i_{t(-1)} + \pi_{11}$

Model 5.b $\Delta i_t = \Delta EXCHR_{t(-1)} + \Delta i_{t(-1)} + \pi_{12}$

In summary, this research attempts to determine whether the fiscal and monetary policies used by the governments of the Asian countries created an unchecked economic bubble that turned into a financial crisis. In the case where directing economic growth is necessary, certain controls and regulations are justified to slow down the capital flow rates and bring the economy to a short run or full equilibrium. The East Asian regions had experienced long periods of foreign capital inflows attracted by high interest rate, predictable exchange rates and little or no capital flow restrictions. Unfortunately, these same conditions provided an avenue for the massive capital flights. Implementation of stringent monetary and fiscal control under perfect capital mobility proved useless in controlling the massive capital reversals. The magnitude of the capital inflows over the years was more than the economy could release into the international financial market in a few months. The following sub-chapter describes the statistical procedures that will be carried out to analyze the defined models and relationships.

3.6 Granger Causality Test

Granger causality testing basically entails determining a specific dynamic relationship between variables that may or may not have any theoretical or functional relationship between them. The basic idea introduced by Granger and Sims is quite simple. If X causes Y, then changes in X should precede changes in Y. If so, two conditions should be met. First, X should help to predict Y by contributing significantly to the explanatory power. It should help to predict Y in a regression of Y against its past values and the past values of X. Secondly, Y should not help to predict X (Pindyck and Rubinfeld 1998). Lagging variables (in a distribution lag model) allows for the impact of shocks that take a while to filter though systems to be measured.

To correctly specify causality relationships, certain characteristics should be tested to determine whether a time series is stationary and avoid spurious regression results. Spurious regression results suggest the existence of statistically significant long – run relationships between variables in a regression model where in actual fact; the results capture existing correlations rather than meaningful causal relations (Zhang 1996). Typical spurious regression results yield very high R squared with very low, non-significant t and F statistical values. Time series data is ordered in and grows with time and for this reason, past values may be correlated with current values. Due to this quality, the behavior of each time series variable over time is examined to determine whether it is stationary or not and whether the underlying d.g.p. includes a trend variable or not. Non stationary data needs to be transformed in order to make it stationary before including it in a regression model (except in the case where non stationary time series in a regression

model are correlated to make the estimation system stationary (Koop 2000)). The process of determining whether time series data is stationary is described under the subtopic 'unit root in time series.' OLS estimation or vector auto-regression (VAR) models will then be used to test for granger causality effects between the selected variables.

3.7 Unit Root in Time Series

3.7.1 Data Stationarity and Unit Root Test

To test of non stationary in levels and differences, the "Augmented Dickey Fuller test" (ADF) is used. If stationarity for a time series variable is achieved after differencing d time, then it is said to be integrated of order d or I (d) (Zhang 1996). It is important to test the order of integration of each series in a model to determine whether they are stationary and if not, how many times they should be difference to be stationary. Testing for stationarity is a univariate time series analysis. The correlation between Current and past values of lags of a variable in level or differenced variable is known as auto-correlation and is denoted as the auto-correlation function r_p [15] (Koop 2000). If Y is highly correlated over time; 'remembers the past,' it will exhibit trend behavior and therefore will have long memory behavior that may not be found in its difference ΔY.

The auto-correlation function of raw data may be one or near one while that of the same difference raw data lags may be near zero. In $Y_t = \alpha + \phi Y_{t-1} + e_t$, if $\phi = 0$, assume that $e \sim IID(0, \sigma^2)$, the time series will exhibit random type fluctuation around 0.01

[15] The correlation between Y and Y lagged p times is referred to as 'auto-correlation at lag p' (Koop 2000) and is represented by the auto-correlation function (a.c.f.) r_p.

(level of critical value) while if $\phi = 0.8$, then trend behavior will be exhibited (Koop 2000). This is illustrated in figures 3.1 and 3.2 respectively.

Figure 3.1 Stationary Random Variable Graphed Against Time

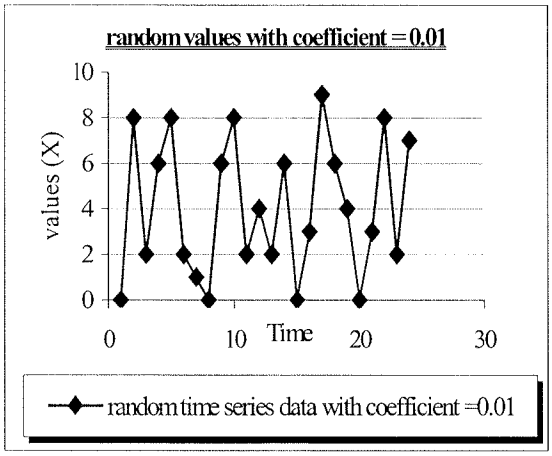
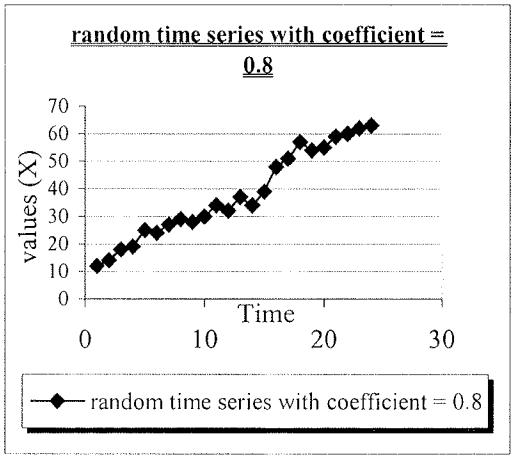


Figure 3.2 Non-Stationary Random Variable Graphed Against Time



A trend with $\phi = 1$ therefore implies non-stationary. In an AR (1) model, Y is stationary if $|\phi| < 1$ and non stationary if $\phi = 1$. $|\phi| > 1$ is rarely considered as it possibly implies the existence of explosive behavior over time (Koop 2000). Auto-correlation will

not drop much as p lag lengths increase. If Y has unit root, then it will have a long memory and will exhibit trend behavior (except if intercept is non zero) Its difference ΔY will be stationary and it's AR (p) will be referred to as a difference stationary series. Given $\Delta Y_t = \alpha + \rho Y_{t-1} + e_t$, if $H_o \rho = 0$ and $H_o \alpha = 0$ fail to be rejected, the AR (p) model is a random walk and Y has a unit root and is non stationary. A random walk is where the current period's value of a variable is equal to last period's value plus a error term that is not predictable (e.g. stock prices) even when deterministic trend has been removed (Kennedy 1998). In my analysis, α is assumed non-zero in the unit root test since the true mean of the d.g.p. is unknown (Harris 1995).

Below is the specification of the AR (p) model to be tested for unit root.

$$Y_t = \alpha + \beta_0 Y_t + \beta_1 Y_{t-1} + ... + \beta_p Y_{t-p} + e_t \qquad (3:1)$$

By subtracting Y_{t-1}, the above equation can be written as

$$\Delta Y_t = \alpha + \rho Y_{t-1} + \gamma_1 \Delta Y_{t-1} + \gamma_2 \Delta Y_{t-2} + ... + \gamma_p \Delta Y_{t-p+1} + e_t \qquad (3:2)$$

$\rho = (\beta_0 + ... + \beta_{p-1})$ and $H_o \rho = 0$ tests for unit root or non stationary (Gujarati 1995).

To determine how far back times series will be lagged the three golden rules of econometrics TTT will be used. As explained by Kennedy (1998, p.87),

> ".....one important dimension if TTT is that data should be allowed to help to determine the specification, especially for model features such as lag lengths about which economic theory offers little guidance."

Therefore to obtain efficient VAR models, the following tests will be carried out.

3.7.2 Selecting Lag Length of AR (p) Model

Specifying the correct model is very important. It ensures that only the significant lagged variables are included in the model and reduces the chances of multi-collinearity. It is advisable to ensure that the difference between the sample size and the number of parameters (degree of freedom) is as large as possible since the variance of their estimates are usually smaller the larger the number of degree of freedom (Kennedy 1998). Selecting the lag length and determining the significance of the deterministic trend should also be carried out before testing for unit root. If a time series is an AR (1), the Dickey Fuller test is carried out. If a simple AR (1) DF model is used when in fact a times series follows an AR (p) process where p>1, then the error term will be auto-correlated to compensate for the mis-specification of the dynamic structure of the series (Harris 1995, p32). Auto-correlation invalidates the use of DF distribution, which assumes that the error terms are white noise. The ADF test is therefore used in an AR (p) time series. To demonstrate the process use to select the lag length in an AR (p) model, the following model specification is used.

$$\Delta Y_t = \alpha + \rho Y_{t-1} + \beta_1 \Delta Y_{t-1} + \ldots\ldots\ldots\ldots + \beta_{p\max-1} \Delta Y_{t-p\max+1} + \delta Tr + \mu_t \qquad (3:3)$$

where Tr is a time trend and μ is an error term. The t-statistic is used to test the null hypothesis $H_o \beta_p = 0$ beginning with the largest $\beta_{p\max} = 0$. If we fail to reject the null hypothesis $H_o \beta_{p\max} = 0$, drop the highest lag and test $\beta_{p\max-1} = 0$. Keep dropping until you reject the hypothesis (i.e. critical p value > calculated p value). Thus if

$\beta_{p\max-3} = 0$ is rejected, then that variable is included in the model as the last variable (Koop 2000).

3.7.3 Testing for Deterministic Trend

After selecting the lag length, test for whether the deterministic trend should be omitted or not by testing $H_o \delta = 0$. If we fail to reject the null hypothesis, then the deterministic trend is significantly equal to zero and is dropped out of the model. It is crucial to test the statistical significance of the deterministic trend because stationary models with deterministic trend can yield time series plots that closely resemble non-stationary models with a stochastic trend (Koop 2000). This leads to spurious regression unit root results when a significant trend is left out of the model because the null hypothesis of unit root would fail to be rejected when in actual fact the true d.g.p contains a deterministic trend. After selecting the lag length and determining if the regression model is an AR (p) difference stationary time series with a deterministic trend, the unit root test using the Dickey-Fuller (DF) test for an AR (1) model or Augmented Dickey-Fuller (ADF) test for an AR (p) is then carried out.

3.8 Unit Root Tests

Testing for unit root is not straightforward and certain issues may arise. As indicated above, the time trend should be put into consideration and tested for significance in the AR (p) model before testing for stationarity. A simple AR (p) model may not always be the final model. Indeed a moving average (MA) term may be included. A trade off between size of sample and power properties of the unit root tests may exist (Harris 1995). A power of test problem may arise with small sample sizes being biased towards accepting the null hypothesis of unit root when the true is in fact stationary or close to unit root. Structural breaks may lead to under rejection of the null hypothesis in annual as well as quarterly data.

3.8.1 The Dickey-Fuller Test

A simple DF test (τ) involves testing for unit root (non-stationarity) $H_o \rho_a = 1$ against $H_o \rho_a < 1$ in a AR (1) series;

$$Y_t = \rho_a Y_{t-1} + \mu_t \qquad (3:4)$$

or testing for unit root $H_o(\rho_a - 1) = 0$ against $H_o(\rho_a - 1) < 0$ in the model $(1-L)Y_t = \Delta Y_t = (\rho_a - 1)Y_{t-1} + \mu_t$ where $(1-L)Y_t = Y_t - Y_{t-1}$. The functions above assume zero mean (intercept), no trend component and $\mu \sim IID(0, \sigma^2)$. The standard approach to test a hypothesis is to use a t-statistic test. Unfortunately, the results of a non-stationary test do not follow a standard t-distribution but a Dickey-Fuller distribution $\left[\frac{(\rho_a - 1)}{(\sigma_{\rho_a})}\right]$. Using the t-statistic instead of the Dickey-Fuller (τ distribution)

will lead to an average over-rejection of the null since the t-statistic < DF τ statistic (Harris 1995). The t-statistic tables also do not adjust for situations where $\alpha \neq 0$ and a deterministic trend exists. By assuming that the underlying d.g.p has zero mean and no deterministic trend, we are implying that trend t=0, and in this case the first observation Y_0 is assumed to be zero (Harris 1995). The mean of the series is determined by the first observation in a unit root test. If the true mean was known, it would be subtracted from each observation, but since this does not happen in practice, the constant α is usually included as in the model below and the DF τ_u is used.

$$\Delta Y_t = \alpha + (\rho_b - 1)Y_{t-1} + \mu_t, \text{ where } \mu \sim IID(0, \sigma^2) \qquad (3:5)$$

Suppose the true d.g.p is a stationary process around a deterministic trend ($Y_t = \alpha + \beta Tr + \mu_t$) and we test for stationarity using the above equation (3:5). The only way to adjust for the trend variable is for the regression equation to set $\rho_b = 1$ (non-stationary condition) in equation (3:5) which is actually true. In this case, $\hat{\alpha}$ becomes $\hat{\beta}$ in the trend $Y_t = Y_0 + \beta Tr + \sum_{j=1}^{t} \mu_j$. This is equivalent to accepting the null hypothesis of non-stationary trend series when in actual sense the true d.g.p is a stationary series with deterministic trend.

This illustration indicates the importance of including as many deterministic variables as are present in the d.g.p. As Harris (1995, p.30) puts it,

> "It is necessary to have as many deterministic regressors as there are deterministic components in the d.g.p and thus we must allow a time trend to enter the regression model used to test for a unit root."

By including the time trend, the model in equation 3:5 becomes

$$\Delta Y_t = \alpha + \gamma Tr + (\rho_c - 1)Y_{t-1} + \mu_t \quad \text{where } \mu \sim IID(0, \sigma^2) \qquad (3:6)$$

The appropriate critical DF value τ_τ will be with a constant and trend.

Inappropriate model specification will lead to over-rejection of the null hypothesis in the case where $\tau < \tau_\mu < \tau_\tau$. Below is the Dickey-Fuller (DF) table for the three, time series d.g.p processes indicated in equations 3:4, 3:5, and 3:6.

Table 3.1, Dickey-Fuller Critical Values

Critical values for the DF-Test									
		DF-τ			DF-τ_μ			Df-τ_τ	
Sample	No Constant & No Trend			With Constant & No Trend			With Constant & Trend		
Size	Level of significance			Level of significance			Level of significance		
	0.001	***0.05***	***0.1***	***0.001***	***0.05***	***0.1***	***0.001***	***0.05***	***0.1***
DF distn									
25	-2.66	-1.95	-1.6	-3.75	-3	-2.63	-4.38	-3.6	-3.24
50	-2.62	-1.95	-1.61	-3.58	-2.93	-2.6	-4.15	-3.5	-3.18
100	-2.6	-1.95	-1.61	-3.51	-2.89	-2.58	-4.04	-3.45	-3.15
t-distn									
	-2.33	-1.65	-1.28	-2.33	-1.65	-1.28	-2.33	-1.65	-1.28

Source: Harris (1995)

Harris (1995) stresses that including deterministic trends in the model beyond those included in the (unknown) d.g.p will decrease the power of the test of unit root hypothesis against the alternative. That is, accept null hypothesis when in fact the d.g.p is stationary. Therefore balance in a model specification is critical.

3.8.2 Augmented Dickey-Fuller Test

The ADF test involves addition of lagged first differences of the dependent variable that may be captured in the error term μ_t if excluded. Banerjee et.al.1993 is quoted by Harris (1995, p.34) as favoring a generous parameterization;

> "..if too many lags are present....the regression is free to set them to zero at the cost of some loss in efficiency, whereas too few lags implies some remaining auto-correlation....and hence the inapplicability of even the asymptotic distributions in...."

Harris (1995) suggests that the lag length should normally be chosen on the basis of the formula $l_{12} = \text{int}\{12(T/100)^{1/4}\}$ reported by Schwert (Harris 1995).

This study follows the step by step process of setting the AR (p) model lags and deterministic trends before testing for stationarity. Since the observations in this study are finite and small, the use of Schwert's lag length formula will not be applicable. Therefore after setting the AR (p) model and testing for the statistical significance of the deterministic trend, the DF table (Table 3.1) will be used to test the null hypothesis of unit root (non-stationarity).

Determining that a time series is unit root (non-stationary) in AR (1) model does not always imply that it is a stationary time series integrated of order one I (1). It can possibly be a stationary integrated time series of order 2 and more. It is important to confirm if it is an I(1) by second differencing and testing for unit root.

$$\Delta^2 Y_t = \phi \Delta Y_{t-1} + \sum_{i=1}^{p-2} \psi \Delta^2 Y_{t-1} + \mu + \mu_t \qquad (3:7)$$

assuming that $\mu \sim IID(0, \sigma^2)$. To test the null hypothesis, the ADF t-statistic $[\hat{\phi} / Se(\hat{\phi})]$ is calculated and compared with the critical values. If $H_o \phi = 0$ against the alternative $H_a \phi < 0$ is accepted then ΔY_t is non-stationary and Y_t contains two unit roots. If the null hypothesis is rejected, if not already carried out, test Y_t for one unit root by first differencing. If a time series contains a unit root, then a regression model involving only ΔY is appropriate (i.e if $H_o \rho = 0$), and the term Y_t will drop out of the equation and only terms involving ΔY_t or its lags appear in the regression (Koop 2000). In summary,

> "If unit root is present, then the data can be differenced to induce stationarity. If two time series, X_t and Y_t are stationary, their dynamic granger causality effect can be analyzed using OLS estimation and interpretation of results from an Auto-regression distributed model (ADL (p,q). If X_t and Y_t contain unit roots, OLS estimation at their levels might be misleading and incorrect. Statistical tests may indicate that $\hat{\beta}$, the estimate of the true β is zero, when the true is not. The only other time that two unit roots can yield correct regression results is when they are co-integrated" (Koop 2000, p.153).

3.9 Tests for Co-integration

For series to be co-integrated, they must have comparable long run properties. A linear combination of two series of I (d) will be I (d). This is because the residuals obtained from both series are also I (d) (Harris 1995). If two time series are integrated to different order, then their linear combinations will integrate to the higher of the two orders (Greene 1993). When times series are non-stationary unit roots, their error terms also exhibit non-stationary behavior. This is because the error terms are sums of two non-stationary time series, X_t and Y_t.

$$e_t = Y_t - \alpha - \beta X_t \qquad (3:8)$$

It is this non-stationary error term that causes spurious regressions. However, it is possible that the unit roots in X_t and Y_t cancels out and the resulting error is stationary. In this special case of co-integration, OLS estimation and interpretation can be done (Koop 2000). The economic interpretation of co-integration is if two time series, both containing stochastic trends, are linked to form an equilibrium relationship over the long run, they will eventually trend together over time to a point where the difference between them will be stable (stationary). "Thus the economic system converges over time and the error term μ_t ..... can be interpreted as the disequilibrium error" (Harris 1995, p.22). The long run relationship between Y and X and the short run dynamics between their deviations from each of their long run trends which can be counter productive can be isolated in the Error correction model (ECM). The ECM preserves these two forms of co-variation (Greene 1993). The Enger-Granger test and Johansen's test for co-integration that will be used in this study are discussed below.

3.9.1 Enger-Granger Two Step Approach

The hypothesis of co-integration consists of two parts; test for I(1) of the individual series and I(0) of a linear combination. Usually the term co-integration testing refers only to the second part of the hypothesis (Bronwyn and Cummins 1999)

Testing the null that X_t and Y_t are not co-integrated involves testing whether $e_t \sim I(1)$ against the alternative that $e_t \sim I(0)$ using the ADF test in the Enger –Granger framework where

$$\Delta e_t = \theta \hat{e}_{t-1} + \sum_{i=1}^{p-1} \theta_i \Delta \hat{e}_{t-1} + \mu + \delta Tr + \varpi_t \qquad (3:9)$$

$\varpi \sim IID(0, \sigma^2)$ and the error term, e_t is obtained and saved from $Y_t = \beta X_t + e_t$. If the deterministic trend and/or constant term are added to the error generating regression of X_t and Y_t, then they should not be added in the system where the error term is the dependent variable (eqn. 4:2) (Harris 1995). The unit root test on the residuals is then carried out such that if the null hypothesis of unit root (not co-integrated) is rejected, then X_t and Y_t are co-integrated. If we fail to reject the null hypothesis, then co-integration exists.

The ADF test for co-integration assumes that the variables in the OLS equation are all I(1) so that the test for co-integration is whether $e_t \sim I(1)$ against the alternative of $e_t \sim I(0)$. If some of the variables are I (2),….."they can co-integrate to I (1) in order to potentially co-integrate with other I(1)" (Harris 1995, p.55). The ADF test does not adjust for this. Also in the case where n>2, there may be more than one co-integration vector

which the ADF test will not able to determine. Johansen's technique adjusts for both these conditions.

3.9.2 Johansen's Procedure

Johansen's technique extends the single equation Error Correction Model (ECM) to a Vector Auto-regression Model to obtain a variant of the Vector Error Correction Model (VECM). It is based on the Granger Representation Theorem that says,

> "If two I(1) variables are co-integrated, then their dynamic specification can be written as an error correction model (ECM) and vice versa, if the dynamic relationship between two variables can be written as an ECM, then they are co-integrated" (Kennedy 1998, p.408).

ECM models integrate the lag of the error term as an explanatory variable in explaining the dynamic relationship between the two co-integrated time series.

$$\Delta Y_t = \phi + \lambda e_{t-1} + \omega_0 \Delta X_t + e_t \qquad (3:10)$$

e_{t-1} is the error term obtained from the regression model with X_t and Y_t ($e_{t-1} = Y_{t-1} - \alpha - \beta X_{t-1}$), its coefficient λ is assumed to be less than zero while e_t is the ECM error term. In explaining ΔY_t (in equation 3:10), if ΔX_t is assumed zero, then ΔY_t will be explained by the error correction term λe_{t-1}. When $\lambda < 0$, Y_{t-1} is above its equilibrium level. Values of Y will start falling in the next period correcting for the dis-equilibrium in the model (Koop 2000). The ECM has both long-run and short-run properties embedded in it. $\hat{\beta}$ is still the long run multiplier and since the errors are from regressing X_t and Y_t, its effects are also included in the e_{t-1} as well as in ΔX_t. There is a

tight connection between co-integration and the ECM (Greene 1993). The ECM is the equilibrium error that takes care of spurious regression where X_t and Y_t are both unit roots. In the presence of co-integration, the ECM is Integrated at order zero [I(0)] implying a stationary system. If two time series are co-integrated, then we should be able to test the implied restriction in an otherwise unrestricted VAR. This is the same ideology used in the Johansen co-integration test. An ECM with lags and deterministic trend is a restricted ADL Δ(p,q) model that is estimated using a two step procedure (Koop 2000).

$$\Delta Y_t = \phi + \delta Tr + \lambda e_{t-1} + \gamma_1 \Delta Y_{t-1} + ... + \gamma_p \Delta Y_{t-p} + \omega_0 \Delta X_t + ... + \omega_q \Delta X_{t-q} + e_t \qquad (3:11)$$

The ECM multivariate model that allows all dependent variables to be potentially endogenous is called a Vector Error Correction Model (VECM). The Johansen trace test is formulated from a VAR model specified in matrix form as

$$\Delta z_t = \Gamma_1 \Delta z_{t-1} + ... + \Gamma_{k-1} \Delta z_{t-k+1} + \Pi z_{t-1} + \mu_t \qquad (3:12)$$

Where $\Gamma_i = -(I - A_1 - ... - A_i), (i = 1,...,k-1)$, $\Pi = -(1 - A_1 - .... - A_k)$ (Harris 1995, p.77) and Z is the dependent variable vector. Π Matrix contains information on the long run relationship ($\Pi = \alpha\beta'$) where β is a matrix of long run coefficients and α represents the speed of adjustment to dis-equilibrium (Harris 1995).

$$\begin{bmatrix} \Delta y_{1t} \\ \Delta y_{2t} \\ \Delta x_t \end{bmatrix} = \Gamma_i \begin{bmatrix} \Delta y_{1t-1} \\ \Delta y_{2t-1} \\ \Delta x_{t-1} \end{bmatrix} + \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \\ \alpha_{31} & \alpha_{32} \end{bmatrix} \begin{bmatrix} \beta_{11} & \beta_{21} & \beta_{31} \\ \beta_{12} & \beta_{22} & \beta_{33} \end{bmatrix} \begin{bmatrix} y_{1t-1} \\ y_{2t-1} \\ x_{t-1} \end{bmatrix} + \mu_t$$

> "Johansen's method of reduced rank tests for a particular restriction on the coefficient matrix of lagged dependent variables by estimating two VARs and obtaining their eigenvalues for a function of their joint residual covariance matrix" (Bronwyn and Cummins 1999 p.103).

The matrix Π produces linear combinations of Z, which may all not be co-integrated. The number of independent linear combinations will be $r < m$ where m is the number of all variables on the left hand side. Co-integration implies restriction on the rank of Π.

The above equation 3:12 can be written as,

$$\Delta z_t + \alpha\beta' z_{t-k} = \Gamma_1 \Delta z_{t-1} + ... + \Gamma_{k-1} \Delta z_{t-k+1} + \mu_t \qquad (3:13)$$

and run as two regressions to separate the short run and long run effects:

$$\Delta z_t = P_1 \Delta z_{t-1} + ... + P_{k-1} \Delta z_{t-k+1} + R_{0t} \qquad (3:14)$$

$$z_{t-k} = T_1 \Delta z_{t-1} + ... + T_{k-1} \Delta z_{t-k+1} + R_{kt} \qquad (3:15)$$

The vectors R_{ot} and R_{kt} are then used to obtain residual (product moment) matrices:

$$S_{jj} = T^{1} \sum_{i=1}^{T} R_{1t} R_{jt} \text{ where i,j=0,k} \qquad (3:16)$$

Then maximum likelihood estimate of β is obtained as the eigenvalues from the formula

$| \lambda S_{kk} - S_{k0} S_{00}^{-1} S_{0k} | = 0$, which gives the n eigenvalues $\hat{\lambda}_1 > \hat{\lambda}_{2>} > .... > \hat{\lambda}_n$ and corresponding eigenvectors $\hat{V} = (\hat{v}_1, ..., \hat{v}_n)$. Generally, if Π matrix has full rank (i.e. $r = n$ linearly independent columns), then the variables in z_t are I(0) while if Π is zero, then there is no co-integration. If Π has reduced rank ($r \leq (n-1)$ then there are r co-integration vectors (Harris 1995). Time series Processor (TSP) programming language is used to obtain the Johansen's test and Enger-Granger test results to determine co-integration in time series.

3.10 Unit Root, Co-integration and Granger Causality Test

Conclusion of tests of unit root and co-integration will lead to three frameworks for granger causality analysis depending on whether time series are stationary, non-stationary, co-integrated and on the levels of integration at which they become stationary.

The first situation is the regression of stationary time series variables. When X_t and Y_t are stationary, OLS estimation of the ADL (p,q) regression model (3:17) specified below is used.

$$\Delta Y_t = \alpha + \delta Tr + \rho Y_{t-1} + \gamma_1 \Delta Y_{t-1} + ... + \gamma_{p-1} \Delta Y_{t-p+1} + \theta X_t + \omega_1 \Delta X_t + ... + \omega_q \Delta X_{t-q+1} + \varepsilon_t$$

This differenced form of the ADL (p,q) model reduces the chances of multicollinearity problems often encountered in first levels regressions of macroeconomic times series with their lags. The long run effect or total multiplier, which is the difference in the permanent change between the old and new values of the dependent variables as a result of changes in its previous lags and that of explanatory variables, can be obtained by the following ADL (p,q) long run multiplier. $-\phi/\rho$. This is the coefficient of the raw data, X_t and Y_{t-1} (Koop 2000). This function is only applicable if the time series are stationary since ρ should be statistically less than zero (or negative – to reject the null hypothesis of unit root). To measure the temporary, short run or marginal effects, the statistical significance of the difference explanatory variables is determined.

The second situation is the regression of unit root time series that are co-integrated. Regression of series with unit roots results in spurious regressions except in

the case where some linear combination of them is stationary due to co-integration. On determining that two or more unit roots are co-integrated using the Enger-Granger or Johansen's test, the following two steps OLS process in the ECM specification is used.

$$e_{t-1} = Y_{t-1} - \hat{\alpha} - \hat{\beta} X_{t-1} \qquad (3:18a)$$

$$\Delta Y_t = \vartheta + \delta Tr + \lambda e_{t-1} + \gamma_1 \Delta Y_{t-1} + ... + \gamma_p \Delta Y_{t-p} + \omega_0 \Delta X_t + ... + \omega_q \Delta X_{t-q} + \varepsilon_t \qquad (3:18b)$$

In this case, $\hat{\beta}$ in the first OLS estimation equation gives the long run effects (multiplier effect) while the point estimates of λ and ω_q give the short run effects.

The third scenario is where time series variables have unit roots but are not co-integrated. This is when we fail to reject the null hypothesis of both time series the unit root ADF test and error terms unit root ADF test embedded in the Enger-granger test for no co-integration. The following difference variant for the ADL (p,q) model (3:19) may be used.

$$\Delta^2 Y_t = \alpha + \delta Tr + \phi_1 \Delta Y_{t-1} + \gamma_1 \Delta^2 Y_{t-1} + .. + \gamma_{p-1} \Delta^2 Y_{t-p+1} + \theta \Delta X_t + \omega_1 \Delta^2 X_1 + .. + \omega_q \Delta^2 X_{t-q+1} + \varepsilon_t$$

$\Delta^2 Y_t = \Delta Y_t - \Delta Y_{t-1}$. Interpreting the OLS estimates in this specification will be different. We can obtain estimates of long run effects from statistical significance of the effects of small change in the change of X_t on the change in Y_t (Koop 2000).

Granger causality analysis in single equation representation implicitly assumes all explanatory variables are exogenous. In this situation, it is difficult to determine dynamic relationships as well as co-integration in more than two variables. In the light of this, it has now become common to adapt simultaneous equation formulation where each

variable is modeled in terms of its own past lags and those of others in a vector notation. This need to analyze the dynamic relationships in time series variables is what has lead to the widespread use of VAR, VECM and Johansen's tests making it even easier to accomplish multivariate time series analysis using OLS estimation.

3.10.1 Summary of Granger Causality Test Models

As discussed above, there will be three possible models for testing granger causality. The ADL(p,q), ECM and second differenced ADL (p,q) Model are reformulated into vector notation giving rise to the VAR model and VECM of estimation as indicated below. VAR Model:

$$\Delta Y_t = \alpha + \rho Y_{t-1} + \theta_{10} X_t + \sum_{i=1}^{p} \gamma_i \Delta Y_{t-i} + \sum_{j=1}^{q} \omega_j \Delta X_{t-j} + \delta Tr + \varepsilon_{1t} \qquad (3:20)$$

$$\Delta X_t = \eta + \pi X_{t-1} + \theta_{20} Y_t + \sum_{i=1}^{r} \gamma_i \Delta X_{t-i} + \sum_{j=1}^{s} \omega_j \Delta Y_{t-j} + \delta Tr + \varepsilon_{2t} \qquad (3:21)$$

where $(\varepsilon_{1t}, \varepsilon_{2t})$ is a serially independent random variable vector with zero mean and finite covariance matrix (full rank). To test the presence of unidirectional, bi-directional or no causal relationship in the model, the F-test is used to test the joint significance of the coefficients of the causal variables. In the case where to unit roots are co-integrated, the ECM is used as indicated below.

$$\Delta Y_t = \vartheta + \sum_{i=1}^{m} \gamma i \Delta Y_{t-i} + \sum_{j=1}^{n} \omega_j \Delta X_{t-j} + \lambda e_{1t-1} + \delta Tr + \varepsilon_{1t} \qquad (3:22)$$

$$\Delta X_t = \tau + \sum_{i=1}^{p} \gamma i \Delta X_{t-i} + \sum_{j=1}^{q} \omega_j \Delta Y_{t-j} + \tau e_{2t-1} + \delta Tr + \varepsilon_{2t} \qquad (3:23)$$

Where $e_{1t-1} = Y_{t-1} - \alpha - \beta X_{t-1}$ and $e_{2t-1} = X_{t-1} - \alpha - \theta Y_{t-1}$, $(\varepsilon_{1t}, \varepsilon_{2t})$ are serially independent error terms and λ, τ are the error correction coefficients. β and θ represent the long run/ total multiplier effect while the coefficients of differenced variables give the short run effects. λ and τ have in them an embedded long run effect that indicates the significance of the disquilibrium of the error term in the co-integration relationship.

On the other hand if the time series are not co-integrated, the following second difference ADL (p,q) model is used and the statistical significance of the variables interpreted in terms of the effects of changes in short run changes. OLS estimation is used because by second differencing it is assumed that the system becomes stationary.

Equation 3:24;

$$\Delta^2 Y_t = \alpha + \delta Tr + \phi_1 \Delta Y_{t-1} + \gamma_1 \Delta^2 Y_{t-1} + .. + \gamma_{p-1} \Delta^2 Y_{t-p+1} + \theta \Delta X_t + \omega_1 \Delta^2 X_1 + .. + \omega_q \Delta^2 X_{t-q+1} + \varepsilon_t$$

CHAPTER 4

DATA AND EMPIRICAL RESULTS

4.1 Data

The research methodology discussed in chapter three is employed to investigate the effects of exchange rate data/values of the selected East Asian Countries (Thailand, Indonesia, Korea, Philippines and Malaysia). Empirical regression results of quarterly data will be used to statistically describe the events of the East Asian financial crisis while regression results from annual panel data analysis will be used to compare the parameter estimates of the East Asian and East African regions. The historical macroeconomic data used in this analysis was obtained from the IMF International Financial Statistics on CD-ROM for various years.

4.1.1 Data Used for the Empirical Analysis of Financial Crisis

To describe the events prior to and during the East Asian Financial Crisis three empirical analyses for three time frames will be studied using quarterly recorded IMF data. The first analysis will be of the East Asian macroeconomic and financial events of the last nineteen years from 1980:1 to 1999:3. Reported results are from 1982:2 to 1999:3 due to adjustments made for lagged and differenced variables in the regression model. This quarterly data will be analyzed to determine the effects of monetary and macro policies on the economy of the region. The event of these nineteen years is then divided into two parts; events prior to the financial crisis and events during and after the crisis. Quarterly data from 1980:1 to 1994:4 will be used to carry out a granger causality

regression analysis for the period leading to the financial crisis. The period during and after the crisis will be analyzed using the remaining quarterly subset data from 1995:1 to 1999:3.

For all the three time frames, the dynamic effects of the nominal and real exchange rates (EXCHN & EXCHNR) and the differential interest rates (DRATE) on selected balance of payments sub accounts will be studied. The balance of payments sub accounts include real and nominal Balance of Trade (BOT & BOTR respectively), financial account balance (FIN), Balance of Payment (BOP), International reserves (Ir), Government expenditure (EXPN), Investment into the reporting economy (INVIN) and Investments out of the reporting economy (INVOUT). The estimated parameter coefficients will give an insight into the influence of the exchange rate regime and monetary policies on the economic changes before and during the financial crisis, and their significance in controlling the massive capital inflows experienced during these periods.

For Kenya, Tanzania and Uganda, quarterly data is limited to exchange rates (EXCHN), differential interest rates (DRATE), international reserves (Ir), and treasury bills (TBILL). Due to this limitation, all forecasts will be done using annual data while quarterly data will be used to examine the effects of exchange rate on government monetary policy decisions observed through changes in differential interest rates (DRATE) and international reserves (Ir).

4.1.2 Comparative Analysis Data

The second part of the empirical analysis is a comparative analysis of the East Asian and East African regions to detect any statistically significant similarities and differences in their parameter estimates. This analysis will be carried out using the Auto-regressive distribution lag – ADL (q,p) models to test for granger causality in the IMF annual panel data. The results obtained from the panel analysis of data for Indonesia, Korea, Thailand, Philippines and Malaysia will be compared to those obtained from regressions of annual panel data for the same period for Kenya, Uganda and Tanzania for the period ranging from 1981 - 1999. The causal effects of both the nominal and real exchanges rate, (EXCHN & EXCHNR) on differential interest rates (DRATE) and on the real and nominal balance of Trade (BOT &BOTR respectively), Financial account (FIN), Balance of Payments (BOP), International reserves (Ir), Budget deficit/surplus (BUDGET) and Government expenditure (EXPN) sub-accounts will be tested. Effects of monetary policies implemented by central banks on the economies will be analyzed by testing the causality relationship between the discount rate and the balance of payments sub accounts. The Chow's test (Greene 1993) will be used to test for structural breaks in the ADL (q,p) granger causality test coefficient estimates of the annual panel data for the East Asian and East African region,. This give a statistical indication of the differences in economic trends of the two regions, with the goal of forecast a financial crisis in East Africa. The definition of the balance of payment components and transformations carried out on them are found in Appendix A.

4.2 Unit Root and Co-integration Test Results

4.2.1 Lag Lengths of AR (p) Model

It is very important to specify the correct functional model before carrying out unit root test or any time series regression analysis. Statistically significant lags and deterministic trend should be included in the uni-variant models before testing for unit root by dropping any insignificant lags of variables on the right hand of the equation and leaving only those that are statistically significant. After the lag lengths are determined, the deterministic trend (Tr) is inserted into the AR (p) model and maintained as a variable if found to be statistically significant. The following is a summary of the time series lag lengths (p) and the significant deterministic trends (Tr).

Table.4.1, Lag Length and Deterministic Trends for Indonesia Korea and Thailand Data (1980:1 to 1999:3)

	Indonesia				**Korea**				**Thailand**		
Variable	CONST	AR(p) LAG	TR		CONST	AR(p) LAG	TR		CONST	AR(p) LAG	TR
EXCHN	X	AR(1)			X	AR(1)			X	AR(1)	
EXCHNR	X	AR(1)			X	AR(2)	X		X	AR(1)	X
DRATE	X	AR(1)			X	AR(1)			X	AR(1)	
BOT	X	AR(2)			X	AR(1)			X	AR(1)	
BOTR	X	AR(1)			X	AR(1)			X	AR(1)	
FIN	X	AR(1)			X	AR(1)			X	AR(1)	
BOP	X	AR(1)			X	AR(1)			X	AR(1)	
IR	X	AR(2)			X	AR(1)			X	AR(3)	X
BUDGET	X	AR(1)	X		X	AR(1)			X	AR(1)	
EXPN	X	AR(2)	X		X	AR(1)			X	AR(5)	
INVIN	X	AR(2)			X	AR(2)			X	AR(2)	X
INVOUT	X	AR(1)			X	AR(1)			X	AR(1)	X

Note: x indicates statistical significance while AR represents auto-regression lags, CONST denotes the intercept while Tr implies time trend.

Source: Regression based on IMF data for various years

As indicated in the table above, the variables with the highest number of statistically significant lags are Thailand's' government expenditure (EXPN) and international reserves (Ir) with lags of five and three quarters respectively. Chou and Chao (2001) in their study of effectiveness of currency devaluation on output also determined that real exchange rates are I(1) both in Indonesia and Philippine and I(2) in South Korea.

Table.4.2, Lag Length and Deterministic Trends for Philippines and Malaysia Data (1980:1 to 1999:3)

	Philippines				**Malaysia**		
Variable	CONST	AR(p) LAG	TR		CONST	AR(p) LAG	TR
EXCHN	X	AR(1)	X		X	AR(1)	
EXCHNR	X	AR(1)	X		X	AR(1)	
DRATE	X	AR(1)			X	AR(2)	
BOT	X	AR(2)					
BOTR	X	AR(1)	X				
FIN	X	AR(1)	X				
BOP	X	AR(1)	X				
IR	X	AR(1)	X		X	AR(2)	X
BUDGET	X	AR(1)			X	AR(1)	
EXPN	X	AR(2)			X	AR(1)	X
INVIN	X	AR(1)					
INVOUT	X	AR(1)	X				

Note: x indicates statistical significance while AR represents auto-regression lags, CONST denotes the intercept while Tr implies time trend.

Source: Regression based on IMF data for various years

Philippines' variables are auto-regressive of one with the exception of balance of trade (BOT) and government expenditure (EXPN), which have two auto-regressive lags. For the East African variables, Tanzania and Uganda exchange rates have the highest statistically significant lags of three with the other variables being either one or two.

Table.4.3, Lag Length and Deterministic Trends for Kenya, Uganda and Tanzania Data (1980:1 to 1999:3)

Kenya				**Uganda**				**Tanzania**			
Variable	CONST	AR(p) LAG	TR	Variable	CONST	AR(p) LAG	TR	Variable	CONST	AR(p) LAG	TR
EXCHN	X	AR(2)	X	EXCHN	X	AR(3)	X	EXCHN	X	AR(3)	X
EXCHNR	X	AR(2)	X	EXCHNR	X	AR(1)	X	EXCHNR	X	AR(1)	
DRATE	X	AR(2)	X	DRATE	X	AR(1)	X	DRATE	X	AR(1)	
REV	X	AR(2)		IR	X	AR(1)	X	IR	X	AR(1)	X
EXPN	X	AR(2)	X	TBILL	X	AR(1)		TBILL	X	AR(1)	
BUDGET	X	AR(1)									
IR	X	AR(1)									

Note: x indicates statistical significance while AR represents auto-regression lags, CONST denotes the intercept while Tr implies time trend.

Source: Regression based on IMF data for various years

The above results imply that the uni-variate models used to test for unit root in the time series variables will have the above statistically significant lag lengths and deterministic trends. In this study, it is assumed that the means of the variables are unknown and not zero so that the constant is always inserted in the models.

Testing for lag length and the significance of the deterministic trend is important because it reduces chances of multi-collinearity as well as eliminates any insignificant lagged variables thereby improving the goodness of fit. Once the functional form of the uni-variate model is determined, unit root tests are carried out.

4.2.2 Test for Unit Roots - ADF Test Results

The ADF unit root test determines if the coefficient of the first lag Y(-1) in a first difference equation, is statistically significant. If the estimated Dickey Fuller τ (tau) is more negative than the critical value from the Dickey Fuller tables, then the variable has a unit root and is integrated at order one. If we fail to reject the unit root hypothesis, the hypothesis test that the unit root exists is done on second difference values to determine if they are integrated of order two. The results of the unit root augmented Dickey-Fuller tests for the selected East Asian are presented in Appendix C. The East Asian time series variables exhibit unit roots properties and become stationary after first or second differencing.

The East African time series variables have unit roots with Kenya's BUDGET and DRATE becoming stationary after first difference and the others time series after second difference.

Since the time series contain unit roots, it will be inappropriate to carry out OLS estimation on their raw values. Unit root results are important in defining the level of difference that will make the time series stationary, consequently avoiding spurious OLS regression results. Once the raw and differenced variables are stationary, the regression models should also be tested for unit root or co-integration of variables. The methods of estimating the systems of equations will differ depending on the level of difference the variables take to become stationary and whether or not they are co-integrated.

There are three possible approaches to estimate the stationary time series models. The first one is when times series are stationary at their first and second difference forms

but are not co-integrated. In this case, the standard VAR models (indicated in chapter three as equation 3:20 and 3:21) will be used with each variable included at it's stationary level. The second condition is when two series having unit root, are integrated at order one and are co-integrated. They will be regressed using their first difference form in the Error correction model (ECM) as specified in equations 3:22 and 3:3. The third situation is where time series become stationary at the second difference and are co-integrated. They will be regressed using their second difference form in the error correction model (ECM) as in equation 3:24. To determine which models to used, co-integration tests are carried out.

4.2.3 Test for Co-integration – Engle Granger Approach

The Engle-Granger test was carried out to test for co-integration in the system of equations. The results are summarized in the Appendix D. The Engle-Granger test is limited in that it estimates co-integration between a maximum of two variables. It is also not capable of estimating for co-integration between variables that are integrated at levels higher than one. As specified in Harris (1995), some variables integrated at order 2 can co-integrate to I(1) in order to integrate with other I(1). The ADF test embedded in the Engle-Granger test does not adjust for this. My estimates have the above characteristics and therefore, the Engle-Granger test will not be efficient in testing for co-integration in multivariate models, for this reason, the Johansen trace test for co-integration is used.

4.2.4 Test for Co-integration - Johansen Procedure

When the Johansen (trace) test rejects the first null $H_o r = 0$ (no co-integration), it implies the presence of one co-integrating vector. If the second null $H_o r \leq 1$ is rejected there are two co-integrating vectors. Failing to reject the third hypothesis that $H_o r \leq 2$, implies co-integration between two variables in a system of three variables. Results from the Bivariate Johansen (trace) co-integration test (presented in the Appendix E) indicate that all bi-variate equations in Korea, Philippines and Malaysia are stationary. In Indonesia, exchange rates and differential rate are not co-integrated while Thailand's real exchange rate and differential interest rates as well as international rates and real exchange rate did not co-integrate.

Co-integration test on the multivariate models formulated in chapter three reveal that any equation in Indonesia that included either the real or nominal exchange rates or the differential rates, did not become stationary. The two variables are integrated at order two but did not co-integrate to order one and their interaction with another third variable did not form a stationary model. The multivariate Johansen (trace) co-integration test results are presented in Appendix F. The same applies for Thailand models that have both international reserves and real exchange rates. These non-stationary models would be estimated as ADL (p, q) in multivariate regression or as a VAR (p) model in a bi-variate OLS regression. To avoid difficulties in interpreting the dynamic effects of more than two unit roots in a regression, the bi-variate VAR (p) will be used while stationary models will be estimated using the Error Correction model as in equation 3:22 and 3:23.

4.3 Granger Causality Results – Financial Crisis

4.3.1 Empirical Results of East Asian Economic Events, the Last 19 Years

The results of the regressions analyzing the economic events within each of the selected East Asian countries beginning in 1982 quarter two and ending in 1999 quarter three are presented in Appendix G. They indicate macro-economic trends that are most dominant prior to and during the crisis period. A statistically significant error correction term ($\lambda(e_{t-1})$ suggests the presence of at least one granger causality effect in the specified relationship while the coefficient estimate $(\hat{\beta})$ of the first step OLS (using raw data) used to estimate the error correction model represents the long run multiplier effect.

Model 1: Regression results between the changes in exchange rate and trade balance reveal that Indonesia is the only country where changes in real and nominal exchange rates have statistically significant granger causality effects on the changes in real and nominal balance of trade. As indicated by the positive multiplier coefficient $(\hat{\beta})$, an increase (depreciation) in real exchange rate caused a contraction in the trade balance. In their analysis of the effects of real exchange rate volatility on aggregate real output (GDP), Chou and Chao (2001) also determined that Indonesia is the only East Asian country where real exchange rate devaluation caused a long-term contraction in output.

Table 4.4, ECM Model 1 Results for Indonesia, 1982:2 to 1999:3

Dep. Var.	Ind. Vars	ECT coeff.	P-value	Sig	Adj. R-sq	Bhat	P-value
DBOT	DEXCHN	-0.273	[.037]	*	0.220	170369	[0.000]
DBOTR	DEXCHNR	-0.304	[.020]	*	0.216	3190.3	[0.000]

Source: Regression based on IMF data

The collapse of export oriented conglomerates that were heavily financed by foreign capital during the currency crisis is attributed to the decline in export trade volumes while the fall in incomes is as a result of a decline in domestic consumption.

Model 2: In Indonesia, a positive statistically significant effect exists between financial account and real exchange rate.

Table 4.5a, VAR Model 2a Results for Indonesia, 1982:2 to 1999:3

Dep. Var.	Ind. Vars		F – stat	P-value	sig.	Adj. R-sq	Indept. Var	Bhat
DFIN	SDEXCHNR	SDRATE	5.311	[.000]	**	0.448		
SDEXCHNR	SDRATE	DFIN	54.452	[.000]	**	0.910	DFIN	-0.881E-07
SDRATE	DFIN	SDEXCHNR	38.040	[.000]	**	0.875	DEXCHNR	

Source: Regression based on IMF data

The increases in financial account are either due to increase in capital inflows or a decrease in capital outflows.

Table 4.5b, VAR Model 2b Results for Indonesia, 1982:2 to 1999:3

Dep. Var.	Ind. Vars		F – stat	P-val	Sig.	Adj. R	Indept. Var	Bhat.	P-val
SDINVIN	SDEXCHNR	SDRATE	33.046	[.000]	**	0.867	DRATE(-3)	3.07E+08	[.001]
SDEXCHNR	SDRATE	SDINVIN	39.781	[.000]	**	0.887	DINVIN	-1.25E-05	[.019]
SDRATE	SDINVIN	SDEXCHNR	40.363	[.000]	**	0.881	DINVIN	1.37E-07	[.011]

Source: Regression based on IMF data

Increases in capital inflows in Indonesia lead to (decrease in) appreciation of the exchange rate and a rise in differential interest rates. These relationships display the perverse effect of monetary policies implemented by the Indonesian government in order to curb the capital inflows, exchange rate appreciation and export trade contraction before the onset of the crisis. Raising interest rates attracted more capital inflows, which in turn lead to the appreciation of the pegged exchange rate.

In the short-run, variability of the financial account balance granger caused changes in the differential interest rates in Philippines, Thailand and Korea. This relationship is insignificant in the long-run except in Philippines and Korea as indicated by their significant beta coefficients at a 5% level of significance.

Table 4.5c, ECM Model 2a Results for Philippines, Thailand and Korea, 1982:2 to 1999:3

Philippines

Dept. Var.	Indept. Var	ECT coef	P-val	sig.	Adj. R-sq	Indept. Var	Bhat.	P-val
DDRATE	DFIN	-0.114	[.009]	**	0.137	DFIN(-1)	(-0.507E-09)	[.000]

Thailand

Dept. Var.	Indept. Var	ECT coef	P-val	sig.	Adj. R-sq	Indept. Var	Bhat	P-val
DFIN	DEXCHNR	-0.150	[.048]	*	0.059			
DDRATE	DFIN	-0.124	[.024]	*	0.062			

Korea

Dep. Var	Indept. Var.	ECT coef.	P-value		Adj. R-sq	Indept. Var	Bhat	P-val
DFIN	DEXCHNR	-0.503	[.002]	**	0.282	-	-	
DFIN	DDRATE	-0.531	[.002]	**	0.263	-	-	
DDRATE	DFIN	-0.097	[.009]	**	0.233	DDRATE	-0.222893	[.011]

Source: Regression based on IMF data

In Thailand, uni-directional, short run granger effect were observed between the changes in financial account and the differential rates while a bi-directional short run relationship exists in Korea. The directional effect (negative or positive) of the real exchange rate changes and differential interest rates on the financial account is better understood by observing their relationship on capital inflows and outflows.

In Thailand, a positive granger causality relationship exists between capital inflows, capital outflows and the changes in real exchange and differential rates.

Table 4.5d, VAR Model 2b Results for Thailand, 1982:2 to 1999:3

Thailand

Dept. Var.	Indept. Var		F stat	P-Val	Sig	AdjR	Indept. Var	Bhat	P Val.
DINVIN	SDEXCHNR	SDRATE	9.243	[.000]	**	0.622	SDEXCHNR(-2)	3.16E+07	[.004]
SDEXCHNR	SDRATE	DINVIN	16.82	[.000]	**	0.760	DINVIN, (-1)	1.00E-08	[.000]
SDRATE	DINVIN	SDEXCHNR	6.588	[.000]	**	0.528	DINVIN(-3)	4.46E-09	[.046]
DINVOUT	SDEXCHNR	SDRATE	6.472	[.000]	**	0.523	DEXCHNR	1.44E+08	[.021]
							SDEXCHNR	-1.13E+08	[.038]
							SDRATE(-3)	7.61E+07	[.010]
SDEXCHNR	SDRATE	DINVOUT	9.711	[.000]	**	0.635	DINVOUT(-1)	2.03E-09	[.016]
SDRATE	DINVOUT	SDEXCHNR	8.954	[.000]	**	0.614	INVOUT,	-1.10E-09	[.006]
							DINVOUT, (-1)	2.35E-09	[.001]

Source: Regression based on IMF data

The positive effect of exchange rate and capital inflows may be an empirical representation of the high investor confidence in the managed exchange rate prior to crisis. Exchange rate depreciation was so predictable (at about 4 percent per annum) that it created an incentive to capital inflows and subsequent capital out flows in Thailand. The positive effect of exchange rate and capital outflows represents a change in capital directional flows with the turn of events during and after the crisis.

Changes in differential interest rates on the other hand had no effect on the changes in capital flows in Thailand but the reverse granger effect was statistically significant so that increases in capital inflows lead to increases in differential rates. The capital inflows acted as feedback to the central banks who continued to provide attractive investment returns as incentives for investors to keep rolling over their investments.

In Philippines, real exchange appreciation and marginal increases in differential rates in the short run granger caused a rise in capital inflows while increases in past values of capital inflows contributed to appreciation of the real exchange rates. The

results are consistent with the effects of unrestricted interest rates in a liberalized capital market. Philippines removed interest rate restrictions in 1983 and dismantled most exchange rate controls after 1992 before implementing them again during and after the crisis.

Table 4.5e, VAR Model 2b Results for Philippines, 1982:2 to 1999:3

Dept. Var.	Indept. Var		F stat.	P-Val	sig.	Adj. R	Indept. Var	Bhat
DINVIN	SDEXCHNR	SDRATE	5.041	[.000]	**	0.447	SDEXCHNR, SDRATE	-6.63E+07 6.43E+07
SDEXCHNR	SDRATE	DINVIN	5.879	[.000]	**	0.494	DINVIN(-1)	-3.76E-09
SDRATE	DINVIN	SDEXCHNR	7.655	[.000]	**	0.571		

Source: Regression based on IMF data

In Korea, the long run negative granger effects of changes in capital outflows on both exchange rates and differential rate are highly significant. The spillover effects of the crisis into Korea occurred mainly due to a loss of confidence by investors in the investment opportunities in the Asian region. As with other affected countries, Korea experienced increased capital outflows which depressed domestic interest rates and consequently lead to the (decrease) appreciation of exchange rates. Appreciation of the exchange rate with increased capital outflow could be as a result of government intervention during the crisis in an effort to maintain a managed exchange rate regime.

Table 4.5f, ECM Model 2b Results for Korea, 1982:2 to 1999:3

Korea

Dep. Var	Indept. Var.	ECT coeff.	P-value	sig.	Adj. R-sq	Bhat	P-value
DDRATE	DINVIN	-0.097	[.013]	*	0.180	5.68E-06	[.000]
DEXCHNR	DINVOUT	-0.240	[.011]	*	0.184	-7.23E-06	[.000]
DDRATE	DINVOUT	-0.091	[.028]	*	0.167	-1.98E-08	[0.01]

Source: Regression based on IMF data

Model 3: In Indonesia, a decrease in differential interest rates granger caused an expansion of the balance of payments which led to the appreciation of the real exchange rate changes and a further increase in differential rates.

Table 4.6a, VAR Model 3a Results for Indonesia, 1982:2 to 1999:3

Indonesia

Dept. Var.	Indept. Var		F - stat	P-val	sig.	Adj. R	Indept. Var	Bhat.	P-val
DBOP	SDEXCHNR	SDRATE	4.702	[.000]	**	0.411	SDRATE(-2)	-2.03E+08	[.035]
SDEXCHNR	SDRATE	DBOP	41.258	[.000]	**	0.884	DBOP	-6.50E-08	[.019]
SDRATE	DBOP	SDEXCHNR	39.647	[.000]	**	0.870	DBOP(-2)	-1.25E-09	[.009]

Source: Regression based on IMF data

The expansion in the balance of payments due to high capital account surplus may have contributed to (the decrease) appreciation of the real exchange rate, while the decline in interest rates may have been due to a drop in productivity of investment opportunities in Indonesia. The granger effect of changes in balance of payment on the changes in real exchange rate has the highest coefficient of correlation of 0.884.

Table 4.6b, VAR Model 3b Results for Indonesia, 1982:2 to 1999:3

Indonesia

Dept. Var.	Indept. Var		F - stat	P-vaL	sig.	Adj. R	Indept. Var	Bhat	P-val
SDIR	SDEXCHNR	SDRATE	5.800	[.000]	**	0.493	SDRATE(-3)	-5.68E+07	[.048]
SDEXCHNR	SDRATE	SDIR	15.186	[.000]	**	0.742	SDIR(-1)	-3.63E-07	[.003]
SDRATE	SDIR	SDEXCHNR	32.080	[.000]	**	0.863	DDRATE	-1.42804	[.001]
							DEXCHNR	0.011161	[.010]

Source: Regression based on IMF data

It is important to note that the granger causality effects of Indonesia's differential rates and exchange rates on the balance of payment and international reserves is the same

but of different magnitude. These effects represent the period prior to the crisis characterized by high capital inflows and exchange rate appreciation.

Table 4.6c, ECM Model 3a Results for Thailand, 1982:2 to 1999:3

Thailand

Dept. Var.	Indept. Var	ECT coef	P-val	sig.	Adj. R	Indept. Var	Bhat	P-val
DBOP	DEXCHNR	-0.253	[.050]	*	0.175		-3.10E+08	[0.022]
DBOP	DDRATE	-0.326	[.007]	**	0.081			

Source: Regression based on IMF data

In Thailand, exchange rates and differential rates have a short-term granger effect on the balance of payments. Devaluation of the exchange rate in the long run granger causes a decline in balance of payment. This impact is observed during and after the float of the Thai baht when exchange rate devaluation and decreased productivity caused a contraction in the economies.

Table 4.6d, VAR Model 3b Results for Thailand, 1982:2 to 1999:3

Thailand

Dept. Var.	Indept. Var		F stat.	P-Val	sig.	Adj. R	Indept. Var	Bhat	P-val
SDEXCHNR	SDRATE	SDIR	10.196	[.000]	**	0.648	SDIR(-2)	-5.90E-09	[.005]
SDRATE	SDIR	SDEXCHNR	6.547	[.000]	**	0.526			
SDIR	SDEXCHNR	SDRATE	3.589	[.000]	**	0.341	SDEXCHNR	-0.472631	[.016]

Source: Regression based on IMF data

A negative bi-directional granger effect is observed between Thailand's variations in the international reserves and real exchange rate changes with the effects of international reserves on changes in exchange rate being more statistically significant. As with the balance of payments, increases in international reserves granger cause real exchange rate appreciation.

Table 4.6e, ECM Model 3a Results for Philippines, 1982:2 to 1999:3

Philippines

Dept. Var.	Indept. Var	ECT coef	P-val	sig.	Adj. R	Indept. Var	Bhat	P-val
DBOP	DEXCHNR	-0.724	[.006]	**	0.461	DEXCHNR(-1)	1.53E+08	[.043]
DBOP	DDRATE	-0.729	[.002]	**	0.381			
DDRATE	DBOP	-0.108	[.017]	*	0.135	DBOP(-1)	2.00E-08	[.032]
DEXCHNR	DDIR	-0.123	[.013]	*	0.046			

Source: Regression based on IMF data

In Philippines, depreciation of the real exchange rate led to the expansion of the balance of payments which put upward pressure on the differential rates. As mentioned earlier, Philippines had established a relatively open economy with limited monetary and exchange rate policy controls prior to the crisis. The relationship between interest rates, exchange rates and balance of payments in Philippines corresponds to the expectations of a liberalized financial and capital market so that increases in balance of payment (due to capital surplus or improvement in trade balance) cause increases in interest rate. Devaluation of the exchange rate improves export trade and this is reflected in trade balance expansion. The short run granger effects of international reserves on real exchange rates exist but are not significant enough with a low coefficient of correlation of 0.046.

In Korea, variations in real exchange rate have a positive long run granger effect on the international reserves which have a positive effect on the changes in differential rates. Real exchange rate depreciation increases the foreign currency earned through export trade and induces an increase in demand for domestic currency and interest rates.

Table 4.6f, ECM Model 3a Results for Korea, 1982:2 to 1999:3

Korea

Dep. Var	Indept. Var.	ECT coeff.	P-value	sig.	Adj. R-sq	bhat	P-val
DBOP	DDRATE	-0.635	[.011]	*	0.348		
DDRATE	DBOP	-0.097	[.010]	**	0.220		
DDIR	DEXCHNR	-0.121	[.027]	*	0.469	3.64E+08	[0.000]
DDRATE	DDIR	-0.090	[.027]	*	0.208	5.14E-11	[0.017]

Source: Regression based on IMF data

Model 4: Indonesia's government expenditure does not have a granger effect on any of the balance of payment components tested in the model.

Table 4.7a, ECM Model 4a Results for Philippines, 1982:2 to 1999:3

Philippines

Dept. Var.	Indept. Var	ECT coef	P-val	sig.	Adj. R-sq	Indept. Var.	Bhat	P-val
DEXCHNR	DEXPN	-0.507	[.000]	**	0.231			2.43E-10 [.000]
DDRATE	DBUDGET	-0.095	[.021]	*	0.189		-	
						DBUDGET(-2)	-7.91E-11	[.000]

Source: Regression based on IMF data

In Philippines however, increases in government spending granger caused an increase (depreciation) in real exchange rate. Changes in budget balances had a negative effect on the changes in differential rates so that an increase in lagged values of budget balance (reduction in deficit or an increase in surplus) lead to a short and long term decrease in differential interest rates. Philippine's contracting government expenditure during the last nineteen years followed by the expected reduction in debt issue, lead to the subsequent decrease in domestic interest rates.

In Korea and Thailand, government spending associated with their fiscal and monetary policies had a great effect on the balance of payment components. Changes in government spending had a positive effect on change in real exchange rate and

differential rates. Increase in government spending lead to a devaluation of the real exchange rate and an increase in differential rates with the increased sale of bonds.

Table 4.7b, ECM Model 4.a and 4b Results for Thailand, 1982:2 to 1999:3

Thailand

Dept. Var.	Indept. Var	ECT coef	P-val	Sig.	Adj. R-sq	bhat	P-val
DEXCHNR	DEXPN	-0.311	[.000]	**	0.318	1.86E-10	[.000]
DFIN	DEXPN	-0.199	[.017]	*	0.111	-	
DDRATE	DBUDGET	-0.118	[.024]	*	0.211	-	

Source: Regression based on IMF data

The effects of the changes in fiscal policy are evident in the significant granger causality effect of the budgetary balance on differential rates.

Table 4.7c, ECM Model 4a and 4b Results for Korea, 1982:2 to 1999:3

Korea

Dep. Var	Indept. Var.	ECT coeff.	P-value	sig.	Adj. R-sq	Indept. Var.	bhat/coef.	P-val
DEXCHNR	DEXPN	-0.449	[.001]	**	0.318		3.78E-11	[.000]
DDATE	DEXPN	-0.090	[.034]	*	0.161		1.04E-13	[.005]
DFIN	DEXPN	-0.589	[.000]	**	0.407	DEXPN(-2)	4.11E-04	[.003]
DBOTR	DEXPN	-0.155	[.030]	*	0.209	DEXPN(-1)	-2.41E-06	[.000]
DBUDGET	DEXCHNR	-0.561	[.034]	*	0.867		1.89E+09	[.000]
DDRATE	DBUDGET	-0.100	[.010]	**	0.182		-	

Source: Regression based on IMF data

In Korea, the positive effects of increases in government expenditure on the financial balance imply increased financial liability. Effects of fiscal and monetary policies are captured in the significant relationship between the real exchange rate, budget deficits and differential rates in the long run. These same effects are reported in Malaysia.

Table 4.7d, ECM Model 4a and 4b Results for Malaysia, 1982:2 to 1999:3

Malaysia

Dept. Var.	Indept. Var.	ECT coeff.	P-val.	sig.	Adj. R-sq	Indept. Var. Bhat	P-val
DDRATE	DEXPN	-0.092	[.032]	*	0.098		4.85E-10 [.000]
						DEXPN(-1)	-6.74E-11 [.037]
DFIN	DEXPN	-0.571	[.000]	**	0.375	DEXPN(-2)	0.331793 [.010]
DDRATE	DBUDGET	-0.081	[.019]	*	0.118		-

Source: Regression based on IMF data

Model 5: Results for Indonesia, Korea and Thailand suggest a statistically significant positive effect of exchange rate policy on the domestic interest rates with a Coefficient of correlation of 0.884. As expected, Philippines did not have any significant results from the exchange rate and interest rate regression since it did not use monetary and exchange rate policies to control its economy prior to the financial crisis.

Table 4.8a, VAR Model 5 Results for Indonesia and Thailand, 1982:2 to 1999:3

Indonesia

Dept. Var.	Indept. Var	F - stat	P-value	sig.	Adj. R	Indept. Var	Coeff.	P-val
SDEXCHNR	SDRATE	13.605	[.000]	**	0.622	DDRATE	213.399	[.002]
						SDRATE	-170.249	[.007]
SDRATE	SDEXCHNR	50.916	[.000]	**	0.867	DEXCHNR	0.010868	[.010]
						SDEXCHNR	-9.22E-03	[.016]
SDEXCHN	SDRATE	19.169	[.000]	**	0.703	DDRATE	346.616	[.000]
						SDRATE	-254.991	[.004]
SDRATE	SDEXCHN	48.877	[.000]	**	0.862	SDEXCHN(-2)	6.65E-03	[.000]

Thailand

Dept. Var.	Indept. Var	F - stat	P-value	sig.	Adj. R	Indept. Var	Coeff.	P-val
SDEXCHNR	SDRATE	10.958	[.000]	**	0.561	DEXCHNR(-1)	-0.8573	[.006]
						SDEXCHNR(-3)		
SDRATE	SDEXCHNR	8.999	[.000]	**	0.507			

Source: Regression based on IMF data

Uni-directional negative causality effects of changes in real and nominal exchange rates on differential rates in Korea have statistically significant f-statistics.

Table 4.8b, VAR Model 5 Results for Korea and Malaysia, 1982:2 to 1999:3

Korea

Dept. Var.	Indept. Var.	ECT coeff.	P-val.	sig.	Adj. R-sq	bhat	P-val
DDRATE	DEXCHNR	-0.083	[.041]	*	0.213	2.36E-02	[.000]
DDRATE	DEXCHN	-0.096	[.009]	**	0.245	2.62E-03	[.000]

Malaysia

Dept. Var.	Indept. Var.	ECT coeff.	P-val.	sig.	Adj. R-sq	bhat	P-val
DEXCHN	DDRATE	0.127	[.018]	*	0.057	0.04412	[.000]

Source: Regression based on IMF data

Parameter estimates for Malaysia had a low coefficient of correlation.

4.3.2 Summary

The use of fiscal, monetary and fixed/pegged exchange rate regimes in Indonesia, Thailand, Philippines and Korea is evident. While Philippine did not engage in the use of exchange rates and monetary policies prior to the crisis, the effect of its fiscal policies on interest rates and exchange rate are significant.

In Indonesia, Korea and Thailand, the results of the effects of differential interest rates and exchange rates on the financial account support the theory that implicitly guaranteed exchange rates and attractive interest rates contributed to the massive capital inflows. During and after the crisis, capital outflows subsequently caused a deterioration of the exchange rates regimes and collapse of domestic interest rates prices.

The results indicate the expansion of international reserves and the changes in balance of payment (depending on the net effect of the contracting current accounts and expanding financial accounts) prior to the crisis in Thailand, Indonesia and Korea as a consequence of their exchange rate policies. A significant dynamic relationship between exchange rates, interest rates and international reserves as expected of an economy with a loosely pegged/fixed exchange rate regime is observed in the three countries.

Fiscal spending of all the East Asian countries under study significantly affected interest rates, exchange rates and balance of payments; a consequence of the use of monetary policy instruments within a fixed or pegged exchange rate regime.

4.3.3 Prior To, During and After the Financial Crisis

In Indonesia, the bi-directional granger effect observes between the changes in trade balance and the real exchange rate before the financial crisis was no longer present during and after the crisis. With the float of the Indonesia Rupeeh on August 14th 1997, the government was disarmed of the use of the exchange rate as an instrument in directing international trade. Prior to the crisis, changes in capital inflows, international reserves and overall balance of payments did not have any causal effect in the changes in the real exchange rate. The fixed exchange rate regime implemented by the Indonesian government maintained a steady four percent depreciation of the exchange

Table 4.9, VAR and ECM Regression Results for the Periods Prior to (1982:2 to 1994:4) and During and After (1995:1 to 1999:3) the Financial Crisis – Indonesia.

Indonesia			Current sample: 1995:1 to 1999:3 Number of observations: 17					Current sample: 1982:2 to 1994:4 Number of observations: 51				
Dept. Var.	**Indept. Var.**		**ECT coeff.**	**P-value**	**sig.**	**R-sq**	**Adj R**	**ECT coeff.**	**P-value**	**sig.**	**R-sq.**	**Adj. R**
DEXCHNR	DBOTR		-0.585	[.247]		0.399	0.016	0.036	[.010]	*	0.333	0.224
DBOTR	DEXCHNR		-0.702	[.228]		0.268	-0.197	-0.334	[.037]	*	0.348	0.242
Dept. var.	**Indept. Var**		**F stat**	**P-value**	**sig.**	**R-sq**	**Adj R**	**F - stat**	**P-value**	**sig.**	**R-sq**	**Adj R**
DFIN	SDEXCHNR	SDRATE	7.713	[.017]	*	0.953	0.829	2.848	[.006]	**	0.500	0.325
SDEXCHNR	SDRATE	DFIN	45.961	[.000]	**	0.992	0.970	2.405	[.018]	*	0.458	0.268
SDRATE	DFIN	SDEXCHNR	23.424	[.001]	**	0.984	0.942	8.238	[.000]	**	0.743	0.653
SDINVIN	SDEXCHNR	SDRATE	25.712	[.003]	**	0.989	0.951	11.853	[.000]	**	0.822	0.752
SDEXCHNR	SDRATE	SDINVIN	91.055	[.000]	**	0.997	0.986	1.930	[.056]		0.429	0.207
SDRATE	SDINVIN	SDEXCHNR	34.630	[.001]	**	0.989	0.960	6.888	[.000]	**	0.708	0.605
DBOP	SDEXCHNR	SDRATE	13.210	[.005]	**	0.972	0.898	1.955	[.055]		0.407	0.199
SDEXCHNR	SDRATE	DBOP	65.698	[.000]	**	0.994	0.979	1.856	[.070]		0.395	0.182
SDRATE	DBOP	SDEXCHNR	73.238	[.000]	**	0.993	0.980	6.900	[.000]	**	0.685	0.586
SDIR	SDEXCHNR	SDRATE	18.741	[.006]	**	0.985	0.932	3.179	[.003]	**	0.553	0.379
SDEXCHNR	SDRATE	SDIR	11.372	[.015]	*	0.975	0.890	1.765	[.085]		0.407	0.176
SDRATE	SDIR	SDEXCHNR	130.432	[.000]	**	0.998	0.990	5.580	[.000]	**	0.685	0.562
SDEXCHNR	SDRATE		11.946	[.001]	**	0.923	0.846	2.712	[.014]	**	0.373	0.236
SDRATE	SDEXCHNR		43.266	[.000]	**	0.977	0.955	9.561	[.000]	**	0.677	0.606
SDEXCHNR	SDRATE		12.168	[.000]	**	0.924	0.848	5.535	[.000]	**	0.549	0.449
SDRATE	SDEXCHNR		41.714	[.000]	**	0.977	0.953	10.244	[.000]	**	0.692	0.625

rate per annum, preventing the market forces and arbitrage opportunities from correcting the exchange rate prices. After the crisis, a dynamic relationship between these variables became evident.

In Thailand, changes in government spending during and after the onset of the crisis granger caused changes in financial account balance and differential interest rates where prior to the crisis, differential rates determined future government spending. These results may reflect the impact of fiscal and monetary policies used to control the crisis. Contraction of government spending was one of the remedies used during and after the financial crisis that caused a decrease in differential rates and government borrowing. The table below gives the empirical evidence of changes in the macroeconomic events in Thailand.

Table 4.10, VAR and ECM Regression Results for the Periods Prior to (1982:2 to 1994:4) and During and After (1995:1 to 1999:3) the Financial Crisis – Thailand

Thailand			Current sample: 1995:1 to 1999:3 Number of observations: 17				Current sample: 1982:2 to 1994:4 Number of observations: 51				
Dept. Var	**Indept. Var.**		**ECT coeff.**	**P-value**	**sig.**	**R-sq.**	**Adj. R**	**ECT coeff.**	**P-value**	**sig.**	**R-sq.**	**Adj. R**
DEXCHN	DBOT		-1.040	[.242]		0.205	-0.302	-0.150	[.044]	*	0.130	-0.008
DDRATE	DFIN		-0.983	[.056]		0.416	0.045	-0.212	[.003]	**	0.261	0.144
DDRATE	DBOP		-1.271	[.016]	*	0.560	0.281	-0.126	[.023]	*	0.245	0.124
DEXCHNR	DEXPN		-0.345	[.024]	*	0.526	0.225	-0.266	[.001]	**	0.669	0.616
DEXPN	DDRATE		-0.392	[.121]		0.577	0.307	0.138	[.019]	*	0.538	0.464
DDRATE	DEXPN		-1.157	[.024]	*	0.498	0.178	-0.138	[.116]		0.132	-0.006
DFIN	DEXPN		-0.507	[.035]	*	0.458	0.113	-0.204	[.189]		0.473	0.389
DDRATE	DBUDGET		-0.760	[.037]	*	0.606	0.355	-0.118	[.045]	*	0.198	0.071
Dept. var.	**Indept. Var**		**F stat**	**P-value**	**sig.**	**R-sq**	**Adj R**	**F - stat**	**P-value**	**sig.**	**R-sq**	**Adj R**
DINVIN	SDEXCHNR	SDRATE	2.618	[.182]		0.902	0.557	3.58892	[.001]	**	0.576	0.415
SDEXCHNR	SDRATE	SDINVIN	7.740	[.031]	*	0.964	0.840	2.4758	[.014]	**	0.484	0.288
SDRATE	DINVIN	SDEXCHNR	28.593	[.003]	**	0.990	0.955	5.08639	[.000]	**	0.658	0.529
DINVOUT	SDEXCHNR	SDRATE	11.006	[.016]	*	0.975	0.886	3.00782	[.004]	**	0.532	0.355
SDEXCHNR	SDRATE	DINVOUT	4.625	[.075]		0.942	0.738	6.57599	[.000]	**	0.713	0.605
SDRATE	SINVOUT	SDEXCHNR	7.008	[.037]	*	0.961	0.824	5.93459	[.000]	**	0.692	0.575
SDIR	SDEXCHNR	SDRATE	0.672	[.741]		0.702	-0.342	7.02623	[.000]	**	0.727	0.623
SDEXCHNR	SDRATE	SDIR	3.928	[.098]		0.932	0.695	3.75389	[.001]	**	0.587	0.431
SDRATE	SDIR	SDEXCHNR	2.832	[.162]		0.908	0.588	6.32096	[.000]	**	0.705	0.594
SDEXCHNR	SDRATE		5.809	[.008]	**	0.853	0.706	3.66893	[.002]	**	0.440	0.320
SDRATE	SDEXCHNR		3.840	[.029]	*	0.793	0.587	8.58348	[.000]	**	0.648	0.572

The insignificant results of changes in trade balance and financial account on changes in real exchange rate and differential rates after the crisis were as a result of the discontinued use of monetary and foreign exchange policies. The floating of the Thai bhat took away one of the sole tools used by most East Asian countries to encourage export growth (a major trade policy for the region) as well as capital flows. After the float of the Thai bhat, the fluctuations in international reserves were no longer attributed to changes in exchange rates and differential rates. There were no significant granger effects of both the changes in capital outflows on exchange rates and the differential rates in the capital inflows after the crisis.

Table 4.11, VAR and ECM Regression Results for the Periods Prior to (1982:2 to 1994:4) and During and After (1995:1 to 1999:3) the Financial Crisis – Philippines

Philippines			Current sample: 1995:1 to 1999:3 Number of observations: 19					Current sample: 1982:2 to 1994:4 Number of observations: 51				
Dept. Var.	**Indept. Var.**		**ECT coeff**	**P-value**	**sig.**	**R-sq**	**Adj R**	**ECT coeff.**	**P-value**	**sig.**	**R-sq**	**Adj R**
DFIN	DEXCHNR		-0.515	[.231]		0.745	0.583	-0.538	[.041]	*	0.498	0.418
DDRATE	DFIN		-0.804	[.023]	*	0.650	0.428	-0.071	[.036]	*	0.258	0.140
DBOP	DEXCHNR		-0.562	[.567]		0.528	0.228	-0.911	[.008]	**	0.549	0.477
DBOP	DDRATE		-0.503	[.411]		0.434	0.074	-0.857	[.012]	*	0.514	0.436
DDRATE	DBOP		-0.378	[.215]		0.723	0.546	-0.078	[.041]	*	0.261	0.143
DEXCHNR	DEXPN		-0.797	[.012]	*	0.538	0.245	-0.210	[.010]	*	0.253	0.134
DFIN	DEXPN		-0.478	[.273]		0.584	0.319	-0.706	[.017]	*	0.496	0.416
DBUDGET	DDRATE		1.061	[.020]	*	0.650	0.427	-0.630	[.087]		0.516	0.439
DDRATE	DBUDGET		-0.478	[.198]		0.623	0.383	-0.072	[.035]	*	0.285	0.171
DDRATE	DEXCHNR		-1.435	[.032]	*	0.622	0.382	-0.087	[.155]		0.199	0.072
DEXCHN	DDRATE		-0.118	[.546]		0.153	-0.387	-0.205	[.004]	**	0.323	0.216
DDRATE	DEXCHN		-1.811	[.011]	*	0.658	0.441	-0.223	[.015]	*	0.277	0.162
Dept. Var.	**Indept. Var.**		**F stat.**	**P-value**	**sig.**	**R-sq**	**Adj R**	**F- stat.**	**P-value**	**sig.**	**R-sq**	**Adj R**
DINVIN	SDEXCHNR	SDRATE	1.85233	[.291]		0.866	0.399	3.734	[.001]	**	0.586	0.429
SDEXCHNR	SDRATE	DINVIN	1.56526	[.357]		0.846	0.305	7.223	[.000]	**	0.732	0.631
SDRATE	DINVIN	SDEXCHNR	5.79719	[.051]		0.953	0.789	3.164	[.003]	**	0.545	0.373

In Philippines, the observed effects of the real exchange rates on the financial account balance, overall balance of payments and capital inflows are insignificant over

whole period. While fiscal policies observed through changes in budget deficits, determined changes in domestic interest rates before the crisis, the reverse effect is observed during and after the crisis. This implies the use of monetary policies in an attempt to curb the financial crisis. The granger effects of changes in capital inflows into Philippines on exchange and differential rates changes before the crisis became insignificant after the financial crisis while the effects of changes in real exchange rates on the differential rate became significant.

Table 4.12, VAR and ECM Regression Results for the Periods Prior to (1982:2 to 1994:4) and During and After (1995:1 to 1999:3) the Financial Crisis – Korea.

Korea		Current sample: 1995:1 to 1999:3 Number of observations: 19				Current sample: 1982:2 to 1994:4 Number of observations: 51			
Dept. Var	**Indept. Var.**	**ECT coeff P-value**	**sig.**	**R-sq**	**Adj R**	**ECT coeff P-value**	**sig.**	**R-sq**	**Adj R**
DEXCHN	DBOT	-0.042 [.939]		0.425	0.059	-0.074 [.011]	*	0.579	0.510
DBOT	DEXCHN	-0.327 [.170]		0.751	0.592	-0.432 [.039]	*	0.316	0.205
DDRATE	DFIN	0.043 [.869]		0.546	0.256	-0.091 [.033]	*	0.321	0.210
DINVIN	DEXCHNR	-0.023 [.970]		0.651	0.429	-0.364 [.032]	*	0.457	0.369
DINVIN	DDRATE	0.316 [.422]		0.397	0.013	-0.442 [.035]	*	0.422	0.328
DDRATE	DINVIN	-0.900 [.047]	*	0.367	-0.036	-0.144 [.016]	*	0.337	0.229
DINVOUT	DEXCHNR	-0.787 [.097]		0.666	0.454	-1.045 [.004]	**	0.471	0.385
DINVOUT	DDRATE	-1.076 [.019]	*	0.656	0.437	0.131 [.658]		0.370	0.267
DDRATE	DINVOUT	-0.176 [.607]		0.167	-0.364	-0.136 [.028]	*	0.328	0.219
DBOP	DEXCHNR	1.190 [.208]		0.608	0.359	-0.535 [.031]	*	0.457	0.369
DBOP	DDRATE	-1.214 [.122]		0.506	0.191	-0.493 [.026]	*	0.411	0.315
DDRATE	DDIR	-0.883 [.005]	**	0.741	0.577	-0.055 [.416]		0.322	0.211
DEXPN	DEXCHNR	-0.467 [.139]		0.834	0.729	0.296 [.041]	*	0.908	0.893
DFIN	DEXPN	-0.966 [.017]	*	0.664	0.449	-0.235 [.195]		0.381	0.281
DBUDGET	DEXPN	-1.717 [.019]	*	0.928	0.883	-0.645 [.088]		0.909	0.894
DBUDGET	DDRATE	0.054 [.934]		0.869	0.785	-0.849 [.025]	*	0.911	0.897
DDRATE	DBUDGET	-0.229 [.537]		0.169	-0.360	-0.092 [.029]	*	0.337	0.229
DEXCHN	DDRATE	-0.189 [.513]		0.245	-0.235	-0.080 [.004]	**	0.601	0.536
DDRATE	DEXCHN	-0.154 [.664]		0.602	0.348	-0.067 [.118]		0.383	0.283

After the financial crisis, implementation of fiscal policy in Korea through government spending significantly grange caused fluctuations in the financial account. Changes in capital outflows became highly determined by changes in domestic interest

rates relative to world interest rates. These in turn were largely determined by changes in international reserves and capital inflows. During and after the crisis, Korea's currency was pegged to a major currency basket. The significant effects of the real exchange rate on the trade balance, capital inflows, capital outflows and government expenditure observed prior to the crisis became insignificant with the removal of the pegged exchange rate regime. The significant pre-crisis dynamic granger effects of Korea's domestic interest rates and the world interest rates spread on current and lagged nominal exchange rate, trade balance, differential rate and overall balance of payments became insignificant after the crisis. The regression results of the two periods in Korea are shown below.

Table 4.13, VAR and ECM Regression Results for the Periods Prior to (1982:2 to 1994:4) and During and After (1995:1 to 1999:3) the Financial Crisis – Malaysia.

Malaysia		Current sample: 1995:1 to 1999:3 Number of observations: 19				Current sample: 1982:1 to 1994:4 Number of observations: 52				
Dept. Var.	**Indept. Var.**	**ECT coeff**	**P Vaule**	**sig.**	**R-sq**	**Adj R**	**ECT coeff.**	**P-value**	**Sig.**	**R-sq**	**Adj R**
DEXCHNR	DEXPN	-0.116	[.355]		0.236	-0.250	0.058	[.035]	*	0.300	0.188
DDRATE	DEXPN	-0.591	[.010]	**	0.520	0.215	-0.092	[.073]		0.248	0.128
DFIN	DEXPN	-0.818	[.032]	*	0.621	0.380	-0.192	[.302]		0.359	0.258
DDRATE	DBUDGET	-0.599	[.004]	**	0.620	0.378	-0.074	[.063]		0.256	0.138
DDRATE	DEXCHNR	-0.610	[.004]	**	0.621	0.380	-0.168	[.032]	*	0.236	0.114
DEXCHN	DDRATE	0.032	[.816]		0.411	0.037	0.164	[.018]	*	0.241	0.120

In Malaysia, the most significant difference between the pre and crisis periods is the effects of changes in government spending decisions on the changes in differential rate, exchange rate and financial account balance during and after the financial crisis.

4.3.4 Summary

In all the Five Asian countries, Philippines is the only country that did not use exchange rates and monetary policies as an instrument to direct domestic development and international capital flows prior to the crisis. On the contrary, fiscal policies were used to control domestic development. This is implied by the significant granger causal effect of the changes in government spending on differential rates prior the crisis. The direction of the relationship reversed after the crisis.

Although the regression of exchange rates on the balance of trade was only significant for Indonesia, the relationship is in line with the attempt by governments to control the regional trade by manipulating the exchange rates during the pre-crisis era. The lack of a significant granger effect between exchange rates and interest rates, balance of trade, and financial account balance by the East Asian economies after the crisis confirms the loose of policy instruments as tools in manipulating and controlling their domestic economies. What is common among all the countries during and after the crisis, is the significant effect of fiscal policies on the differential rates; an indication of the efforts of the governments to reduce their fiscal spending as recommended by IMF.

4.4 Granger Causality Results – Panel Data Analysis

4.4.1 Regional Empirical Results - Asian Region

4.4.1.1 Hypothesis Test Results

The results of the East Asian panel data regression analysis are presented in Appendix H.1. Annual data for Indonesia, Thailand, Korea, Philippines and Malaysia from 1981 to1999 is pooled into panel time series data and the models specified in chapter three are estimated.

The first model revealed a positive relationship between the changes in nominal exchange rate and the changes in nominal trade balance (BOT) in Thailand and Philippines. This short-run positive and statistically significant relationship is also observed between the real exchange rates and the real trade balance (BOTR) in both countries. The effects of exchange rates at levels and the changes in trade balance reveal that depreciation of nominal exchange rate in the East Asian countries lead to a contraction in the balance of trade in the short-run. Data from Thailand and Philippines contribute to this effect, as indicated by their significant dummy variable coefficients. Philippines political insecurity compounded with the currency crisis led to massive capital flight that was immediately followed by a contraction in domestic investment and export trade. Thailand's foreign funded, export-oriented economy suffered enormously (as reflected in trade balance contraction) before the float of the bhat due to the massive capital flight and decrease in world demand for exports. After the float of Thai's bhat, the depreciated of exchange rates and decreased imports contributed to an increase in the reported export levels. The decrease in reported trade balance immediately after the float

of exchange rates may be attributed to the decrease in world demand and increased price levels. At the onset of the crisis, the decline in quantity traded is responsible for the drop in export trade values while the increase in prices of goods due to exchange rate depreciation explains the increases in import prices.

Model 2 regression results indicate that increases in levels of financial account balance resulted in increases in differential rate changes, while increase in levels of differential interest rates lead to increases in changes in the financial account balances of all the countries, with the exception of Philippines. These results confirm the theory that s rise in interest rates in a bid to stabilize exchange rate appreciation attracted foreign investment capital which consequently through arbitrage, reduced the profit opportunities, depressing the interest rates. Contrary to other Asian countries, Philippines had established a fairly stable banking system and was the first country to remove interest rate restrictions completely in the early 1990s. Therefore, monetary policies were not used to control capital inflows, as was the practice in the Asian countries under study. The lagged effects of the financial account balance have a significantly positive effect on the current financial account balance in Indonesia and Thailand. This shows the importance of the consistent capital inflows into these countries over the years.

Model 3 shows that differential rates of the region are highly determined by the BOP in components. A positive relationship is observed between the BOP and differential rates in Indonesia, Malaysia and Thailand. Present and past changes in the overall BOP have a significantly negative marginal effect on the changes in the differential rate. Indonesia, Malaysia and Thailand constantly used interest rates to

control exchange rate appreciation prior to the crisis. These increased interest rates acted as incentives for foreign capital inflows feeding the international reserves and consequently expanding the BOP deficits (due to the expanding current account deficits and increasing financial account balance). Korea had its exchange rate pegged on a major currency basket and did not have very large fluctuations in exchange rates prior to the crisis. In all the countries, the real international reserves had a negative relationship with the real exchange rates. This represents the negative effect of the increasing international reserve on the artificially appreciated real exchange rates during the peg regime and the effects of the decreasing international reserves on the floated (depreciating) exchange rates.

Regression results from Model 4a indicate that government spending and differential rates in Thailand have a bi-directional granger causality effect, an indication of the dynamic use of fiscal policies. Increases in differential rates (through monetary policies) caused increases in the changes in government spending with these increases causing a further rise in differential rates. In Indonesia, a positive relationship was observed between changes in government spending and changes in differential rates. To increase interest rates, the government borrows from the public by issuing out bonds. This extra currency is used to run government business. Therefore an increase in interest rates is synonymous with increases in government spending funded through Treasuries.

It is of interest to note that there were no significant relationships in model 4b. Levels and changes in government expenditure, financial account balance and real balance of trade had no significant effect on each other.

As observed in Model 5, the exchange rate and the differential interest rates nexus is not prominent in the region though a negative granger causality effect was observed between the changes in differential rates and real exchange rate. Korea and Indonesia contribute significantly to this effect. These were also the only countries to implement IMF recommendations for four and two months respectively after the crisis. Liquidity squeeze and government contraction was some of the conditions attached to the assistance package. Increases in interest rates (due to liquidity squeeze) lead to a contraction in domestic production even after the float of their currencies.

The significant relationships between the real economic variables give a clear picture of the dynamic market forces responsible for the financial distress prior to the float of the exchange rates. Before the crisis, the exchange rate and monetary policies significantly determined the speed, direction and investment duration of capital inflows that in the long run, created the overheated economies in East Asia. The resultant outcome of policies can be observed through the significant granger causality effects of exchange rates and differential rates on the financial and balance of payment data. The regression results obtained using the real balance of trade and exchange rates variables differ in level, effect and significance to the regression results of their nominal variables. The spread between the coefficients of correlation represents the difference between the expected outcome and actual effects of economic policy use. More studying is required before the significance of this disparity as a warning sign of financial distress, can be determined. Divergence of the temporary internal balance from the more stable, global internal equilibrium may be the cause of an unstable, over-extended external balance.

4.4.2 Regional Empirical Results – East African Region

Results of the East African panel analysis are presented in Appendix H.2. Granger causality tests for the this region indicate that in Kenya and Tanzania, current values and past changes in nominal exchange rate granger caused changes in BOT while current values of BOT granger caused changes in nominal exchange rates. The East African economies are highly dependent on international trade with agriculture and tourism being some of the major foreign exchange earners. Slight changes in exchange rate policies significantly affect the BOT. Until the early 1990s, the East African region implemented a variety of pegged exchange rate regimes and currency restrictions. This explains the significant granger causality effects observed between nominal exchange rates and BOT. In Kenya and Tanzania, current values of and past changes in real exchange rates have an uni-directional effect on change in differential rates. Monetary policies were constantly used to control their domestic economies and attract foreign investment.

In Uganda and Tanzania, changes in government spending granger cause change in real exchange rates while in Kenya, current values of and past changes in government spending granger cause changes in financial account balance. It is important to note that the East African governments, until the recent IMF privatization programs, were the main employers and played a major role in the marketing phase of agricultural products. Therefore, fiscal policies contributed significantly to changes in exchange rates and the economy as a whole. Foreign aid programs still provide a substantial amount of foreign exchange to the East African countries, significantly determining their currency rates.

4.4.3 Comparison Analysis Results

The coefficient of correlation (R^2) and the F –statistics results reported from the East African and East Asian panel analysis are used to determine similarities or joint significance in the parameter estimates of the two regions. These ANOVA results are presented in Appendix I with the models of significant similarities between the two regions summarized in the table below. The models are considered significantly similar if both regions have significant F-values at 5% level of significance and R^2 of $\approx 30\%$ or more.

Table 4.14, Models significantly similar in East Asian and East African regions

MODEL 1	Bi-directional granger effect between changes in EXCHN and changes in BOT
MODEL 2	None
MODEL 3	Bi-directional granger effect between changes in DRATE and changes in BOP
	Uni-directional granger effect between changes in DRATE and changes in IR
MODEL 4	Bi-directional granger effect between EXCHNR and EXPN
	Uni-directional granger effects of changes in EXPN on changes in FIN
	Uni-directional granger effects of changes in EXPN on changes in BOTR
MODEL 5	Uni-directional granger effects of changes in EXCHN on changes in DRATE

Source: Regression results of IMF data for various years

To statistically test whether the East Asian and East African data sets are structurally similar, Chow's test is applied. This is an F-statistic used to tests for structural changes between two sub-set data and is developed based on Greene (1993)

discussion of the Chow's test. In this test, it is assumed that the data set from each region is a sub-set of a common sample data set.

To test the hypothesis of no structural change between the models of the two regions, two set of equations are estimated. First, the restricted equation of the full data set, X_i with dummy variables D_i for each country in the two regions is estimated. The restriction model is of the form

$$a_1D_1 + a_2D_2 + a_3D_3 + ... + a_8D_8 + \beta_1X_1 + \beta_2X_2 + ... + \beta_kX_k + \varepsilon_i$$

The sum of squares residuals for the restricted model SSR_R is obtained.

The second equation estimates the parameter coefficients of the unrestricted models. A regional dummy variable is inserted to capture the significance of parameter estimates for countries in Asia. The following equation is estimated

$$a_1D_1 + a_2D_2 + a_3D_3 + ... + a_8D_8 + \beta_1X_1 + \beta_2X_2 + ... + \beta_kX_k + \gamma_1X_1Asia + \gamma_2X_2Asia + ... + \gamma_kX_kAsia + \varepsilon_i$$

The sum of squared residuals for the unrestricted model, SSR_{UR} are obtained.

In the above equation, the first order condition for the East African region will be

$\delta y / \delta X_k = \beta_k$ and the First Order Condition for the East Asian region will be

$$\delta y / \delta X_k = \beta_k + \gamma_k$$

To determine whether the East African parameters, β_k are statistically similar to the East Asian parameters $\beta_k + \gamma_k$, the null hypothesis of no structural change

$H_o : \gamma_1 = \gamma_2 = \gamma_3 = ... = \gamma_k = 0$, is tested using the following Chow's test.

$F_{[df_1, df_2]} = \frac{(SSR_R - SSR_{UR})/df_1}{(SSR_R)/df_2}$ where df_1 is $k_R - k_{UR}$ and df_2 is $n - 2(k_R + k_{UR})$. k is the number of coefficients estimated for each equation. If the calculated F value is not more than the critical value of 2.21, the null hypothesis of no structural change will not be rejected. Results of the Chow's test are presented in Appendix J.

4.4.3.1 Chow's Test Results – Similarities

There are significant similarities between the two regional economies. Both regions have significant granger causality relationships between the real Exchange rate (EXCHNR) and the differential rates (DRATE). This is an indication that both the regions depended highly on the use of monetary and exchange rate policies to control and influence their domestic economies and defend their exchange rate regimes.

An increase in exports (BOT) due to exchange rate devaluation caused an increase in domestic currency supply in both regions. This increased money supply puts downward pressure on domestic interest rates. Due to high dependence of both regions on international trade, changes in EXCHN significantly affect changes in BOT and vice versa.

Another significant relationship that is prominent in both regions is between the changes in government expenditure and the financial account balance. In Africa, foreign capital mainly from IMF and/or World Bank is invested through government programs and non-governmental organization. While the East Asian economies received most direct foreign capital through joint investment ventures and private businesses, their

governments also received loans and financial flows to fund projects that were significant to the financial account balance. This government expenditure/borrowing determined through fiscal policies, significantly granger caused changes in the Balance of Trade (BOT) component in both regions.

Results from both the ANOVA and the Chow's test also show some significant differences between the two regions.

Table 4.15, Models significantly different in East Asian and East African regions

	EAST ASIA	E. AFRICA
MODEL 1	Uni-directional granger effects of changes in BOT on changes in EXCHN	No effect
	Uni-directional granger effects of changes in BOTR on changes in EXCHNR	No effect
MODEL 2	Bi-directional granger effect between changes in FIN and changes in DRATE	No effect
MODEL 3	Uni-directional granger effects of changes in BOP on changes in EXCHNR	No effect
	Uni-directional granger effects of changes in IR on changes in EXCHNR	No effect
MODEL 4	Bi-directional granger effect between changes in EXPN and changes in DRATE	No effect
	Uni-directional granger effects of changes in FIN on changes in EXPN	No effect
	Uni-directional granger effects of changes in BOTR on changes in EXPN	No effect
MODEL 5	Uni-directional granger effects of changes in DDRATE on changes in EXCHNR	No effect

Source: Regression results of IMF data for various years

Relationships from the ANOVA table that are statistically significant in East Asian but not significant in East Africa are reported in Appendix I and summarized in the table above.

4.4.3.2 Chow's Test Results – Differences

Results from the Chow's test suggest significant bi-directional granger causality effects of real exchange rates (EXCHNR) and real balance of trade (BOTR) in the East Asian economies but not the East Africa economies. Though effects of their nominal values were similar in both regions, the effects of their real values differ.

East Asian economies unlike the East African economies were also able to influence foreign capital inflows using monetary policies as implied by the significant effects of differential rates (DRATE) on the financial account (FIN). For both regions though, changes in the financial account balance significantly determine the level of domestic interest rates.

The domestic interest rates of the East Asian region had a significant effect on changes in government expenditure, balance of payments and real exchange rates while in East Africa, domestic interest rates were determined by changes in international reserve levels through their effects in the exchange rate system. This shows the importance of monetary policies in the domestic as well as international transactions of the East Asian economies.

Another important observation in this comparative analysis is the significant relationships between the real exchange rates, differential rates, government expenditure

and balance of trade in East Asia that are not significant in East Africa. These significant relationships may represent periods of financial distress or boom that are not captured in their nominal values and in the East African relationships. The relationships of the nominal variables represent the government's desired objectives of their policy implementations while the relationships of the real variables represent the actual effects of these policies.

While the use of exchange rates and monetary policies significantly attracted foreign direct investment into the East Asian region, their use in East Africa were not significant enough to attract capital inflows but were used to direct domestic growth. Government policies and political stability in East Africa has been the main factor affecting foreign investment flows as implied by the lack of a significant relationship between the real exchange rates, differential rates and trade balance. Implementation of pegged exchange rates in East Asia provided investors with an implicit guarantee backed by sound governments while in East African investor confidence in exchange rate policies is hindered by the lack of a stable and predictable economic and political environment.

CHAPTER 5

INTERPRETATION OF RESULTS

5.1 The Asian Financial Crisis

This study identifies significant granger causality relationships between the foreign exchange rates, interest rates and the balance of payments components for each of the five East Asian countries. The results are consistent with the documented theories on the causes, effects and consequences of pegged exchange rates regimes on the financial crisis.

The statistically significant relationship between the interest rates, exchange rates, financial accounts and capital flows indicates that high investment returns coupled with the pegged exchange rate regimes provided an incentive for capital inflows in the early 1990s. Decline in productivity, reduced export growth, and the realization by investors that foreign currency and money market prices were mismatched, triggered the onset of massive capital outflows. In the environment of close to perfect capital mobility markets, pegged exchange rates become incapable of controlling massive, long run capital outflows leading to a run down of foreign official reserves. This effect is observed in East Asia and is empirically implied by the significant negative relationship between international reserves and foreign exchange rates for the period during the crisis.

In a bid to prevented exchange rate appreciation during the economic boom, the East Asian governments participated as a buyer in the foreign exchange market. To offset the monetary expansion this intervention created, it borrowed from the public raising interest rates and driving private businesses into higher debt. The rise in interest rates

prior to the crisis caused a decline (an appreciation) in real exchange rates. After the float of the exchange rates increases in interest rates had no effect on the changes in exchange rates, but depreciation of the exchange rates reduced demand for domestic currency causing a fall in interest rates. Governments borrowed excessively with the hopes of raising interest rates and controlling the deteriorating exchange rate while domestic residents continue to invest their savings abroad, implying that external debt was financing private sector capital flight.

The role of foreign exchange systems and their policies in hindering economic systems from attaining stable and sustainable growth resistant to speculation attack is evident in this study. The support of this theory is the disparity between the regression results of the real and nominal variables in the East Asian countries for the same specified models. These disparities represent the divergence between the desired goals of monetary, fiscal and exchange rate policy use by central banks and actual or real outcome.

They give great insights into identifying warning signs of overheating economies, financial distress and consequently future crises before they happen. Though policies are nominal instruments for adjusting, directing and controlling the real economic environment, their use is only successful if the economic environment created can be sustained without them. The ultimate challenge of Central banks and Treasuries is the moral obligation to accelerate domestic economic development without leading to financial or external balance distress.

5.2 Comparative Analysis Results

Black markets represent the real measures of macro-economic or balance of payments components of an open economy that is freed of any monetary or exchange rate manipulation by its central banks. The desired effects of monetary, exchange rate or fiscal policies are immediately observed in the changes in nominal values of financial instruments. On the other hand, the real effects adjust at a slower rate and may take between three to five years be fore their effects are observable and/or fully transmitted into the economy.

As indicated by the results of the comparative analysis, both the East Asian and East African regions had some significantly similar in the relationships between the nominal components of their balance of payments, exchange rates and interest rates. Both regions had, in the past, adapted fixed or loosely pegged exchange rate regimes and have transited towards freer exchange rate regimes over the years.

The significant differences between the two regions are only observable through the relationships between their real variables under study, especially during the on set of the East Asian financial crisis. The disparities between the real values of the East Asian and the East African economies indicate their different economic environments. The East Asian region was faced by an economic imbalance indicated by the difference between its real and nominal economic measures. The relationships not only reveal the significance of policies in accelerating and directing economic growth at the expense of external balance but also their inability to control the massive capital reversals and economic contractions. The results of the East African regional data analysis emphasis

the importance of the use of sound fiscal policies in creating sound and stable economic and political environment for investment. Government expenditure significantly affected the financial account balance, trade balance, and exchange rates of the East African countries. The divergence of the real economic outcome of the policies from their intended nominal expectations is not a critical issue in a dynamic economic environment; it is the degree of divergence that should be a concern.

CHAPTER 6

CONCLUSION

This study provides an ex-post empirical explanation of the causal effects of monetary, fiscal and exchange rate policies on the East Asian economies prior to and after the onset of the financial crisis as recorded in their balance of payments components. Its findings supply significant evidence of the contribution of fiscal, exchange rate and monetary policies used by governments of the Asian countries in the creation of the unchecked economic bubble that evolved into a financial crisis. Fiscal and Monetary policies were implemented as sterilization operations to counteract the effects of the pegged exchange rate systems. These fixed/pegged exchange rate regimes significantly but not solely contributed to the financial crisis through their macroeconomic effect on the economy. A flexible exchange rate regime and managed external balance would have lead to internal balance equilibrium and stainable economic growth. The different results obtained using the real variables in place of their nominal variables provide important information on how far apart the objectives of the policies implemented were to their real outcomes. The wider the spread between the nominal and real outcomes, the higher the level of financial distress and the larger the probability of a crisis. The study exposes periods that indicated breakdowns and fragility of the economic sectors prior to the financial crisis that could have been used to anticipate possible victims of speculative attack in advance.

Another significant observation supports Pyo's (1999, p.158) study where he suggested that ..... "a country's degree of financial liberalization and market opening

measures must be commensurate with the country's industrial competitiveness. In other words, there must be a balance in efficiency between financial sector and real sector or the country's currency can be subject to speculative attack when the imbalance between these two sectors begins to widen."

By maintaining high investment returns in a loosely pegged exchange rate regime, the East Asian countries distorted the balance in efficiency between their financial sector and capital sector. The predictability of the loosely pegged exchange rates regimes in Thailand and Indonesia gave investors the perception of reduced exchange rate risk in an environment of attractive investment rates. This attracted speculative money with short-term investment horizons. Short term debt was used to roll over long term obligations as they fell due in investments that were already experiencing reduced productivity. Further study is required to determine whether a country's absolute magnitude of short-term foreign debt can be managed (facilitated by the exchange rate regime) with existing usable foreign official reserves when faced with massive capital reversals (Pyo 1999). This implies that pegged exchange rate regimes during the boom years of the East Asian region provided high short-run investment returns that were not commensurate with the real long-run risk.

The devastating crisis in East Asian urgently warrants for the creation of institutions that predict and detect such crises ahead of time to provide enough time for governments to prepare and be better coordinated. An international financial entity or a global capital control system may be required to cover private risk of short term

international capital flows and reduce massive capital flows and reversals without interfering with the sovereignty of nations.

Now more than ever, the need for efficient crisis prediction models is critical when considering the soaring rate of capital mobility and the recent rise in financial liberalization of developing economies. The process of financial liberalization by central banks has been by monetary, fiscal and exchange rate policy use that create attractive investment opportunities at the expense of their external balance.

Further studies are required to fully understand the connection between microeconomics, macroeconomics and capital flows. Even with the basic knowledge of the existence of the identity between current account and savings-investment balances, there still lacks a workable real model that relates these balances (Krugman 1993).

The second part of the study reveals the need for the East African region to convince investors that sound and stable political and socio-economic environment exists that will support foreign capital investments and economic development. Though their economic growth has been on the decline over the last decade, their balance of payments components do not reveal any regional financial crisis characterized by capital flows during the period under study. Lack of political stability in Africa, contagion effects and international financial institutions cut back on aid are the main reasons for the decline in foreign investment inflows to East Africa. Exchange rate and monetary policies are more significant in determining the microeconomic environment than in controlling the macroeconomics in the East African region.

APPENDIX A: Data Description and Transformation

A.1.Data Description

The variables involved in the analysis are described below as in the IMF International Financial Statistics books.

WIR – Is the World interest rate and is obtained from the annual average London Inter-bank offer rates on U.S. Dollar deposits.

EXCHN – Period averages of market exchange rates and official exchange rates for countries quoting rates in units of national currency per U.S. Dollar.

DIRATE – Discount rate/Bank rate is cited at the end of month basis but published on a period average basis and is the rate at which the monetary authorities lend or discount eligible paper for deposit money banks.

BOT - Balance of Trade is the relevant credit items minus the debit items of Balance of Goods, Services, and Income.

CAB - Current account balance is the credit line minus the debit line of goods, services, income plus current transfers, n.i.e[16]. In this analysis, the BOT is used to represent the CAB; the sum of the BOT and Unilateral transfers, by assuming that the unilateral transfers are not affected by the value or changes in exchange rate.

FIN - Financial account is the net sum of the balance of direct investment, portfolio investment and the other private investment transactions.

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[16] n.i.e. – Denote that exceptional financing items have been excluded from specific capital and financial account components. Exceptional financing includes any other transactions undertaken by the authorities to finance the "overall balance" as an alternative to, or in conjunction with, the use of reserve assets and the use of Fund Credit and loans from the Fund.

KAB – Capital account balance of the credit items (mainly capital transfers linked to the acquisition of a fixed asset other than transactions related to debt forgiveness) minus the debit items. Debit items are capital transfers linked to the disposal of fixed asset by donor or to the financing of capital formation by recipient, plus acquisition of non-produced, non-financial assets).

REV – These are government revenues and comprise all non-repayable government receipts, whether requited, other than grants; revenue is shown net refunds and other adjustment transactions.

EXPN – Is the government expenditure and comprises all non-repayable payments by government, whether requited or unrequited and whether for current or capital purposes.

BUDGET – This is the government deficit or surplus calculated as the difference between the revenue and grants (where applicable) on one hand and expenditure minus repayments on the other hand.

Ir – International reserves are the total foreign reserves minus gold

INVIN – Represents the flow of direct investment capital into the reporting economy.

INVOUT –Represents the flow of direct investment capital out of the reporting economy into market abroad.

BOP – Overall balance is the sum of the balances of the current account, the capital account, the financial account and net errors and omissions.

A.2. Data Transformation

EXCHNR - To analyze the real effects of the exchange rate on the real balance of trade, the nominal exchange rate is transformed to the real exchange rate by multiplying the nominal exchange rate by the relative price ratio of the world price level over that of country being studied.

$$EXCHNR = EXCHN * P^w / P^d$$

The consumer (P^d) and world price (P^w) indices are obtained from the IFS.

BOTR – The real balance of trade is defined as the nominal balance of trade deflated by the country's consumer price index.

$$BOTR = BOT / CPI$$

DRATE – is defined as the differential interest rate and is the domestic discount rate (DIRATE) less the world interest rate (WIR).

Missing discount rates (DIRATE) values for Indonesia from 1988:1 to 1993:3 and for Malaysia from 1996:1 to 1999:3 had to be extrapolated through hedonistic regression. Since the East Asian market rates and discount rates are co-integrated (see Appendix B for the Engle-Granger results), the missing values in DIRATE for both Indonesia and Malaysia were forecasted using the market rate as the independent variable. The theory behind the Security Market Line (SML) equation, that cost of capital is a rate of return plus a premium, is used to formulate a model that will estimate the missing discount rate from the money market rate. The SML equation estimates the required return on a financial asset. Basically, expected rate of return is the sum of a risk free rate plus the

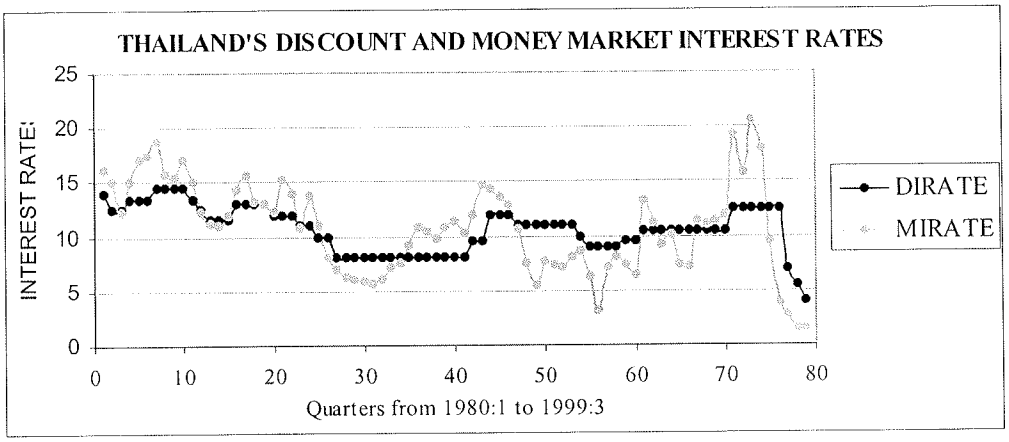
product of the market risk premium and asset risk coefficient (Eugene, Gapenski, and Ehrhardt 1999). The market and discount rate are obtained in the same way with the only difference being the value of the risk premium. Therefore,

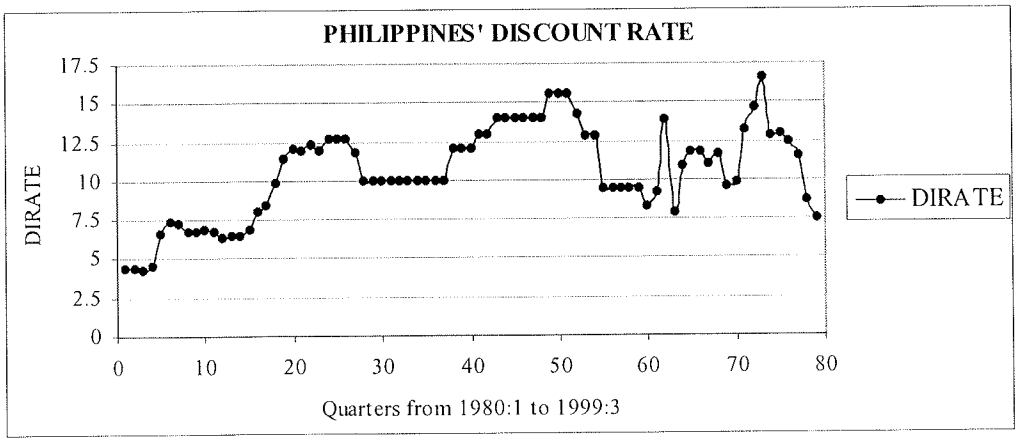
$$MMRATE = f(TBILL, RISK) \text{ And,}$$
$$DIRATE = f(TBILL, RISK) + /- add.risk$$

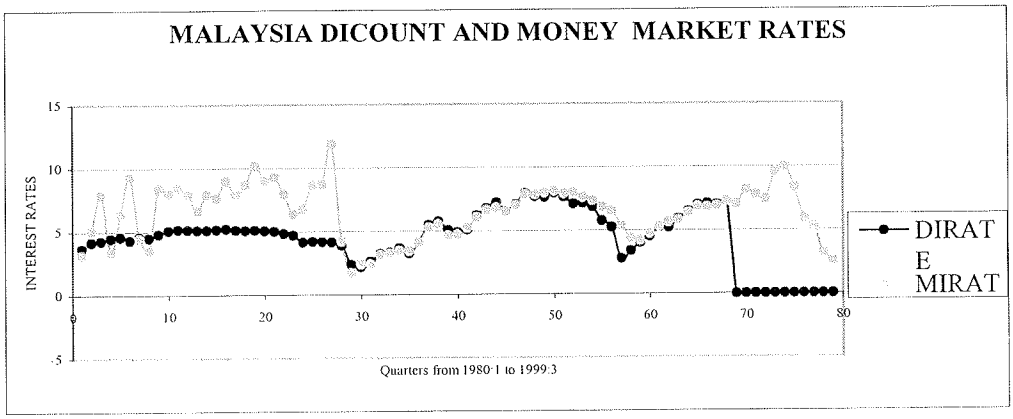
Substituting for MMRATE,

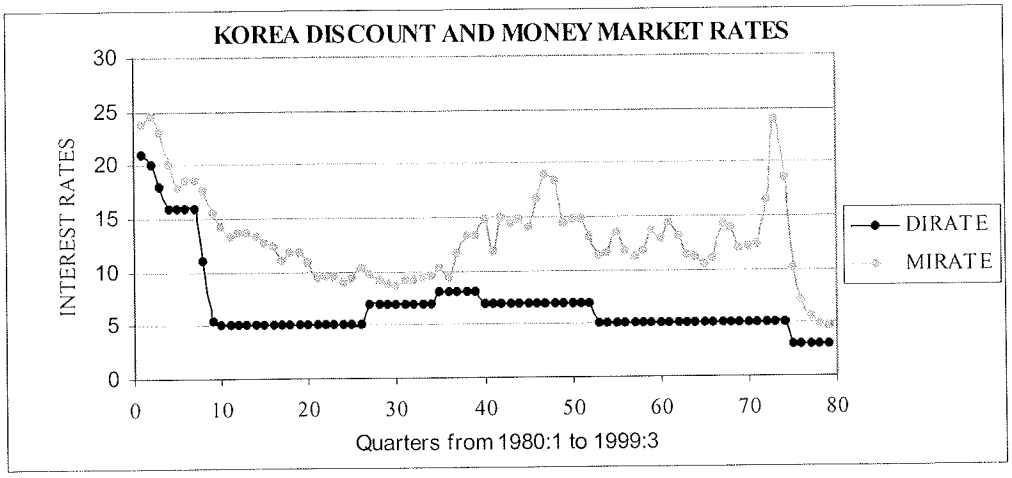
$$DIRATE = f(MMRATE) + /- add.risk$$
$$DIRATE = CONST. + \delta_T MMRATE + \varepsilon_T$$

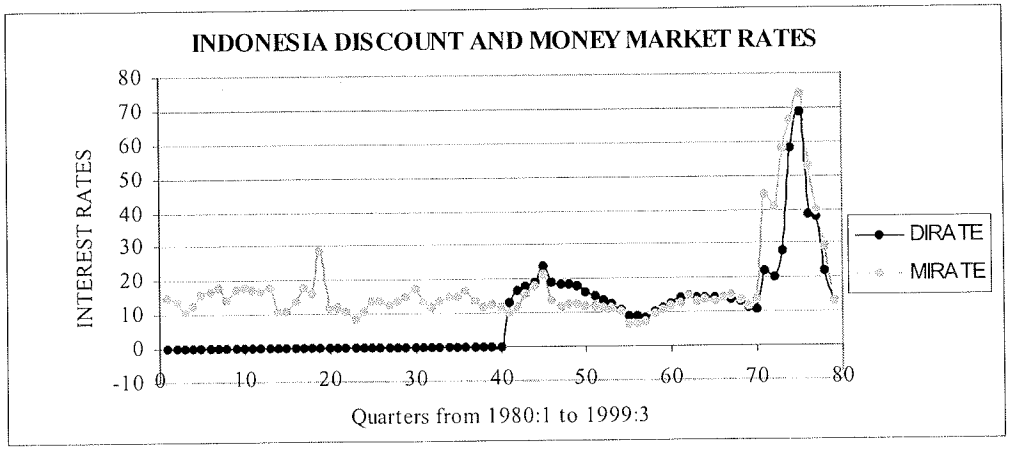
APPENDIX B: East Asian Economies Discount and Money Market Rates (1980:1 to 1999:3)








KOREA DISCOUNT AND MONEY MARKET RATES
INTEREST RATES
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
Quarters from 1980:1 to 1999:3
DIRATE
MIRATE


INDONESIA DISCOUNT AND MONEY MARKET RATES
INTEREST RATES
80
70
60
50
40
30
20
10
0
-10
0
10
20
30
40
50
60
70
80
Quarters from 1980:1 to 1999:3
DIRATE
MIRATE

APPENDIX C: Augmented Dickey Fuller Test for the Presence of Unit Roots

C.1. Unit Root Test Results for Indonesia, Korea, Malaysia and Philippines Data (1980:1 – 1999:3)

		1st Difference ADF unit root test results				2st Difference ADF unit root test results			
	Variable	ADF lag	Y(-1)	Cal.. ADF	Crit.ADF	ADF lag	DY(-1)	Cal. ADF	Crit.ADF
Indonesia	EXCHN	ADF(1)	-0.12011	(-2.01957)	-2.93	ADF(1)	-0.96609	(-8.12826) **	-2.93
	EXCHNR	ADF(1)	-0.18679	(+0.68942)	-2.93	ADF(1)	-0.91251	(-7.71552) **	-2.93
	DRATE	ADF(1)	-0.19327	(-2.81342)	-2.93	ADF(1)	-0.89554	(-7.46476) **	-2.93
	BOT	ADF(2)	-0.20738	(-2.15604)	-2.93	ADF(2)	-2.67055	(-14.5068) **	-2.93
	BOTR	ADF(2)	-0.3487	(-3.77729) **	-2.93				
	FIN	ADF(1)	-0.43127	(-4.29135) **	-2.93				
	BOP	ADF(1)	-0.6194	(-5.69171) **	-2.93				
	IR	ADF(2)	0.018563	(+0.93179)	-2.93	ADF(2)	-0.728	(-5.35508) **	-2.93
	BUDGET	ADF(1)	-1.50775	(-14.9966) **	-3.45				
	EXPN	ADF(2)	-0.37701	(-3.25063)	-3.45	ADF(1)	-1.44963	(-13.69630 **	-2.93
	INVIN	ADF(2)	-0.14393	(-1.81446)	-2.93	ADF(2)	-1.25599	(-6.26986) **	-2.93
	INVOUT	ADF(1)	-0.08093	(-0.990103)	-2.93	ADF(1)	-0.90123	(-4.14287) **	-2.93
Korea	EXCHN	ADF(1)	-0.13173	(-2.03547)	-2.93	ADF(1)	-1.29836	(-11.2784) **	-2.93
	EXCHNR	ADF(2)	-0.16276	(-2.02563)	-3.45	ADF(1)	-1.3626	(-12.1171) **	-2.93
	DRATE	ADF(2)	-0.12649	(-3.64113) **	-2.93				
	BOT	ADF(1)	-0.11207	(-1.84815)	-2.93	ADF(1)	-0.98508	(-8.188) **	-2.93
	BOTR	ADF(-1)	-0.14309	(-2.20934)	-2.93	ADF(1)	-1.09076	(-9.11191) **	-2.93
	FIN	ADF(1)	-0.57664	(-5.32362) **	-2.93				
	BOP	ADF(1)	-0.75393	(-6.34082) **	-2.93				
	IR	ADF(1)	0.055326	(+2.53908)	-2.93	ADF(1)	-0.72064	(-6.10408) **	-2.93
	BUDGET	ADF(1)	-1.20415	(-10.2911) **	-2.93				
	EXPN	ADF(1)	-0.10398	(-1.91311)	-2.93	ADF(1)	-1.50906	(-14.4317) **	-2.93
	INVOUT	ADF(1)	-0.13339	(-2.21332)	-2.93	ADF(1)	-1.22632	(-10.3818) **	-2.93
	INVIN	ADF(2)	0.127528	(+1.65078)	-2.93	ADF(1)	-1.39713	(-12.2661) **	-2.93
Malaysia	EXCHN	ADF(1)	-0.0155	(-0.3933)	-2.93	ADF(1)	-1.00002	(-8.72054) **	-2.93
	EXCHNR	ADD(1)	0.018857	(+1.29135)	-2.93	ADF(1)	-1.02112	(-8.85283) **	-2.93
	DRATE	ADF(2)	-0.04939	(-1.65434)	-2.93	ADF(1)	-0.77797	(-7.40063) **	-2.93
	BUDGET	ADF(1)	-1.12045	(-9.63694) **	-2.93				
	IR	ADF(2)	-0.12264	(-2.90805)	-3.45	ADF(1)	-0.61152	(-5.7083) **	-2.93
	EXPN	ADF(1)	-1.22373	(-10.7003) **	-3.45				
Philippines	EXCHN	ADF(1)	-0.11999	(-2.07177)	-3.45	ADF(1)	-0.96872	(-8.25647) **	-2.93
	EXCHNR	ADF(1)	-0.14127	(-2.31666)	-3.45	ADF(1)	-0.98619	(-8.40055) **	-2.93
	DRATE	ADF(1)	-0.08112	(-2.41609)	-2.93	ADF(1)	-1.13097	(-10.0152) **	-2.93
	BOT	ADF(2)	-0.06395	(-0.616789)	-2.93	ADF(1)	-1.42356	(-12.697) **	-2.93
	BOTR	ADF(1)	-0.20589	(-2.82739)	-2.93	ADF(1)	-1.29163	(-11.5259) **	-2.93
	FIN	ADF(1)	-0.63706	(-5.75023) **	-3.45				
	BOP	ADF(1)	-0.83727	(-7.33889) **	-3.45				
	BUDGET	ADF(1)	-0.45119	(-4.04905) **	-2.93				
	INVIN	ADF(1)	-1.01539	(-4.87351) **	-2.93				
	INVOUT	ADF(1)	-1.12073	(-5.75545) **	-3.45				
	IR	ADF(1)	-0.04189	(-1.12502)	-3.45	ADF(1)	-0.91394	(-7.90543) **	-3.45
	EXPN	ADF(2)	0.044856	(+2.655890)	-3.45	ADF(1)	-1.67243	(-18.4385) **	-3.45

C.2. Unit Root Test Results for Thailand Data (1980:1 to 1999:3)

		1st Difference ADF unit root test results				2st Difference ADF unit root test results			
	Variable	ADF lag	Y(-1)	Calculated ADF	Critical ADF	ADF lag	DY(-1)	Calculated ADF	Critical ADF
Thailand	EXCHN	ADF(1)	-0.05281	(-1.02205)	-2.93	ADF(1)	-1.0529	(-8.88048) **	-2.93
	EXCHNR	ADF(1)	-0.04123	(-1.23245)	-3.45	ADF(1)	-1.01282	(-8.50587) **	-3.45
	DRATE	ADF(1)	-0.07324	(-1.50529)	-2.93	ADF(1)	-0.63335	(-4.23957) **	-2.93
	BOT	ADF(1)	-0.08598	(-1.59401)	-2.93	ADF(1)	-1.10394	(-9.55801) **	-2.93
	BOTR	ADF(1)	5.71E-03	(+0.117556)	-2.93	ADF(1)	-1.29395	(-11.7345) **	-2.93
	FIN	ADF(1)	-0.1348	(-2.21187)	-2.93	ADF(1)	-1.07265	(-9.07124) **	-2.93
	BOP	ADF(1)	-0.32497	(-3.83497) **	-2.93				
	BUDGET	ADF(1)	-0.53561	(-5.10071) **	-2.93				
	INVIN	ADF(2)	-0.58651	(-4.13642) **	-3.45				
	INVOUT	ADF(1)	-0.43835	(-4.60779) **	-3.45				
	IR	ADF(3)	-0.06324	(-2.50699)	-3.45	ADF(1)	-0.43253	(-3.57319) **	-2.93
	EXPN	ADF(5)	-1.90E-03	(-0.082555)	-2.93	ADF(3)	-2.24414	(-7.04846) **	-2.93

C.3. Unit Root Test Results for Kenya, Tanzania and Uganda Data (1980:1 to 1999:3)

		1st Difference ADF unit root test results				*2st Difference ADF unit root test results*			
	Variable	ADF lag	Y(-1)	Calculated ADF	Critical ADF	ADF lag	DY(-1)	Calculated ADF	Critical ADF
Kenya	EXCHN	ADF(2)	-0.13716	(-2.98774)	-3.45	ADF(1)	-0.60896	(-5.49025) **	-2.93
	EXCHNR	ADF(2)	-0.21268	(-3.27565)	-3.45	ADF(1)	-0.82965	(-7.05335) **	-2.93
	DRATE	ADF(2)	-0.30459	(-4.35411) **	-3.45				
	REV	ADF(2)	0.048159	(+1.44214)	-2.93	ADF(2)	-3.63035	(-14.0934) **	-3.45
	EXPN	ADF(2)	-0.16842	(-1.83138)	-3.45	ADF(2)	-2.43539	(-7.31288) **	-3.45
	BUDGET	ADF(1)	-1.03398	(-8.90174)**	-2.93				
	IR	ADF(1)	-0.10751	(-2.04422)	-2.93	ADF(1)	-1.18416	(-6.57314) **	-2.93
Uganda	EXCHN	ADF(3)	-0.05854	(-1.99720	-3.45	ADF(2)	-1.23644	(-7.41541) **	-2.93
	EXCHNR	ADF(1)	-0.05311	-1.4498	-2.93	ADF(1)	-0.87678	(-7.61964) **	-2.93
	DRATE	ADF(1)	-0.57053	(-3.32124)	-3.45	ADF(1)	-1.31885	(-6.20813) **	-2.93
	IR	ADF(1)	-0.07105	(-1.31732)	-3.45	ADF(1)	-1.09965	(-6.62388) **	-2.93
	TBILL	ADF(1)	-0.14673	(-1.40655)	-2.93	ADF(1)	-1.38347	(-4.07134) **	-2.93
Tanzania	EXCHN	ADF(3)	-0.06028	(-2.50375)	-3.45	ADF(1)	-0.39213	(-3.17961) **	-2.93
	EXCHNR	ADF(1)	-0.01531	(-0.824917)	-2.93	ADF(1)	-0.80445	(-6.95271) **	-2.93
	DRATE	ADF(1)	-0.03278	(-1.25504)	-2.93	ADF(1)	-0.70578	(-4.64643) **	-2.93
	IR	ADF(1)	-0.02288	(-0.981544)	-3.45	ADF(1)	-1.28632	(-6.7484) **	-3.45
	TBILL	ADF(1)	-0.03879	(-1.32473)	-2.93	ADF(1)	-0.89919	(-5.86446) **	-2.93

APPENDIX D.: Summary of Bi-variate Engle-Granger (tau) Co-integration Tests

D.1. Bi-variate Engle Granger Results for East Asian Countries

		INDONESIA			KOREA			PHILIPPINES			THAILAND		
Dep.Var.	Indp. Var.	P-value	signf	lags	P-value	sigf.	lags	P-value	signf.	Lags	P-value	signf.	lags
DEXCHNR	DBOTR	0.5841		7	4E-04	**	3	0.104		7	0.192		10
DBOTR	DEXCHNR	0.0082	**	5	0.56		10	2E-05	**	2	2E-05	**	2
DBOT	DEXCHN	0.0479	**	4	0.002	**	2	0.634		5	0.098	**	10
DEXCHN	DBOT	0.1414		7	0.001	**	3	0.017	**	2	0.812		9
DFIN	DEXCHNR	0.1253		6	0.004	**	4	0.025	**	7	4E-04	**	2
DEXCHNR	DFIN	0.4204		10	5.01291D-06	**	2	0.035	**	7	0.196		10
DFIN	DDRATE	0.0363	**	9	0.302		8	0.043	**	9	4E-04	**	2
DDRATE	DFIN	0.1823		6	2.57467D-08	**	2	0.013	**	2	0.044	**	2
DBOP	DEXCHNR	0.0464	**	8	1.08833D-06	**	2	0.002	**	7	0.099		10
DEXCHNR	DBOP	0.2798		9	3E-04	**	2	0.125		7	0.107		10
DBOP	DDRATE	0.1674		8	0.247		10	0.047	**	10	8E-05	**	2
DDRATE	DBOP	0.0721	**	6	2.00056D-08	**	2	0.012	**	2	0.043	**	2
DDIR	DDRATE	0.009	**	5	0.033	**	2	4E-04	**	2	0.966		10
DDRATE	DDIR	0.214		6	2.29632D-08	**	2	0.012	**	2	0.044	**	2
DDIR	DEXCHNR	0.0005	**	2	0.068		7	0.008	**	3	0.232		7
DEXCHNR	DDIR	0.1473		7	0.667		10	0.107		8	0.683		10
DEXPN	DDRATE	0.0401	**	6	0.708		8	1E-04	**	4	0.935		10
DDRATE	DEXPN	0.188		6	2.67053D-08	**	2	0.014	**	2	0.04	**	2
DEXPN	DEXCHNR	0.0442	**	6	0.121		10	7E-05	**	4	0.819		10
DEXCHNR	DEXPN	0.3045		9	0.019	**	10	0.345		10	0.19		10
DEXPN	DFIN	0.0439	**	6	0.172		10	4E-05	**	4	0.956		10
DFIN	DEXPN	0.0003	**	5	0.446		10	0.043	**	9	6E-04	**	2
DEXPN	DBOTR	0.043	**	6	0.725		9	2E-04	**	4	0.508		5
DBOTR	DEXPN	0.0107	**	5	0.002	**	2	3E-05	**	2	3E-05	**	2
DINVIN	DEXCHNR	0.1907		10	0.881		8	0.018	**	10	7E-05	**	3
DEXCHNR	DINVIN	0.9539		10	0.117		10	0.235		10	0.457		10
DINVIN	DDRATE	0.1292		10	0.924		8	0.001	**	7	0.001	**	4
DDRATE	DINVIN	0.1422		6	2.99117D-08	**	2	0.011	**	2	0.507		3
DINVOUT	DEXCHNR	0.0236	**	3	0.002	**	4	0.008	**	6	0.972		10
DEXCHNR	DINVOUT	0.2427		9	0.266		10	0.094		7	0.19		10
DINVOUT	DDRATE	0.0242	**	3	0.001	**	4	0.009	**	6	0.962		10
DDRATE	DINVOUT	0.2161		6	2.82757D-08	**	2	0.013	**	2	0.042	**	2
DEXCHNR	DDRATE	0.0005	**	4	7E-04	**	3	0.104		7	0.121		10
DDRATE	DEXCHNR	0.117		5	2.22737D-08	**	2	0.013	**	2	0.427		3
DEXCHN	DDRATE	0.0099	**	4	0.002	**	2	0.016	**	2	0.002	**	5
DDRATE	DEXCHN	0.2074		5	2.43988D-08	**	2	0.012	**	2	0.427		3

Engle-Granger (tau) Co-integration Results

MALAYSIA

Dep.Var.	Indp. Var.	P-value	signf	lags
DDIR	DDRATE	0.0113	**	4
DDRATE	DDIR	0.0062	**	2
DDIR	DEXCHNR	0.0269	**	4
DEXCHNR	DDIR	0.0013	**	2
DEXPN	DDRATE	0.401		10
DDRATE	DEXPN	0.0083	**	2
DEXPN	DEXCHNR	0.0005	**	10
DEXCHNR	DEXPN	0.2642		10
DEXPN	DFIN	0.053		10
DFIN	DEXPN	0.1302		8
DBUDGET	DEXCHNR	0.0004	**	10
DEXCHNR	DBUDGET	0.2977		10
DBUDGET	DDRATE	0.4651		10
DDRATE	DBUDGET	0.0081	**	2
DEXCHNR	DDRATE	0.0031	**	2
DDRATE	DEXCHNR	0.0068	**	2

APPENDIX E: Bi-variate Johansen Co-integration Results for East Asian Data

E.1 Bi-variate Johansen (trace) Co-integration Results for Indonesia and Korea 1981:3 to 1999:3

Indonesia

Variables:		Num lags	Eigval1	Eigval2	H0:r=0	P-valAsy	H0:r<=1	P-valAsy	Obs
DBOTR	DEXCHNR	Opt:2	0.48	0.42	76.58	5.81617D-09 **	34.38	1.73673D-07 **	70
DBOT	DEXCHN	Opt:2	0.50	0.34	71.11	2.55418D-08 **	26.77	6.83181D-06 **	70
DFIN	DDRATE	Opt:2	0.59	0.29	79.14	2.90315D-09 **	21.65	0.000080761 **	70
DFIN	DEXCHNR	Opt:2	0.78	0.31	120.69	3.76709D-14 **	24.08	0.000025013 **	70
DBOP	DDRATE	Opt:2	0.64	0.27	85.50	5.19097D-10 **	20.44	0.00014498 **	70
DBOP	DEXCHNR	Opt:2	0.75	0.36	115.85	1.39778D-13 **	28.21	3.40666D-06 **	70
DDIR	DDRATE	Opt:1	0.59	0.32	85.68	4.94278D-10 **	25.49	0.000012685 **	71
DDIR	DEXCHNR	Opt:2	0.45	0.15	49.18	9.69858D-06 **	10.51	0.0172 **	70
DEXPN	DEXCHNR	Opt:2	0.59	0.43	92.26	8.32394D-11 **	35.62	9.54722D-08 **	70
DEXPN	DDRATE	Opt:2	0.59	0.20	70.91	2.69837D-08 **	14.29	0.0028186 **	70
DEXPN	DFIN	Opt:2	0.59	0.33	83.01	1.01773D-09 **	25.92	0.000010298 **	70
DEXPN	DBOTR	Opt:2	0.62	0.43	97.66	1.92643D-11 **	35.50	1.01280D-07 **	70
DINVIN	DEXCHNR	Opt:2	0.54	0.21	65.42	1.19334D-07 **	15.24	0.0017848 **	70
DINVIN	DDRATE	Opt:1	0.48	0.24	61.88	3.11437D-07 **	18.25	0.00041682 **	71
DINVOUT	DEXCHNR	Opt:2	0.54	0.23	67.45	6.88557D-08 **	17.07	0.00073632 **	70
DINVOUT	DDRATE	Opt:1	0.44	0.33	66.06	1.00275D-07 **	26.63	7.30107D-06 **	71
DEXCHNR	***DDRATE***	***Opt:2***	***0.53***	***0.03***	***50.00***	***7.75577D-06*** **	***2.28***	***0.52235***	***70***
DDRATE	***DEXCHN***	***Opt:2***	***0.36***	***0.03***	***30.63***	***0.0014698*** **	***1.71***	***0.60332***	***70***

Korea

Variables:		Num lags	Eigval1	Eigval2	H0:r=0	P-valAsy	H0:r<=1	P-valAsy	Obs
DBOTR	DEXCHNR	Opt:3	0.376	0.174	39.811	0.00012255 **	11.499	0.010746 **	68
DBOT	DEXCHN	Opt:2	0.419	0.287	55.545	1.72975D-06 **	21.303	0.000095683 **	69
DFIN	DDRATE	Opt:2	0.447	0.384	67.880	6.12770D-08 **	30.545	1.10523D-06 **	69
DFIN	DEXCHNR	Opt:2	0.577	0.283	75.205	8.43048D-09 **	20.942	0.0001139 **	69
DBOP	DDRATE	Opt:2	0.475	0.436	76.748	5.55083D-09 **	36.130	7.46137D-08 **	69
DBOP	DEXCHNR	Opt:2	0.732	0.267	102.567	5.10362D-12 **	19.569	0.00022091 **	69
DDIR	DDRATE	Opt:2	0.458	0.148	48.748	0.000010898 **	10.125	0.020648 **	69
DDIR	DEXCHNR	Opt:2	0.501	0.145	53.688	2.86032D-06 **	9.887	0.023108 **	69
DEXPN	DEXCHNR	Opt:2	0.801	0.252	120.036	4.50120D-14 **	18.318	0.00040411 **	69
DEXPN	DDRATE	Opt:2	0.787	0.425	132.342	1.60712D-15 **	34.835	1.39394D-07 **	69
DEXPN	DFIN	Opt:2	0.811	0.290	126.715	7.37715D-15 **	21.619	0.000082163 **	69
DEXPN	DBOTR	Opt:2	0.774	0.237	110.656	5.70782D-13 **	17.029	0.00075256 **	69
DINVIN	DEXCHNR	Opt:2	0.528	0.329	72.492	1.75749D-08 **	25.134	0.000015059 **	69
DINVIN	DDRATE	Opt:2	0.476	0.394	72.175	1.91484D-08 **	31.515	6.92328D-07 **	69
DINVOUT	DEXCHNR	Opt:2	0.494	0.262	62.140	2.89947D-07 **	19.182	0.00026631 **	69
DINVOUT	DDRATE	Opt:2	0.507	0.415	78.272	3.67379D-09 **	33.727	2.37972D-07 **	69
DEXCHNR	DDRATE	Opt:2	0.455	0.283	59.239	6.36068D-07 **	20.957	0.0001131 **	69

E.2 Bi-variate Johansen (trace) Co-integration Results for Philippines and Thailand, 1981:3 to 1999:3

Philippines

Variables:		Num lags	Eigval1	Eigval2	H0:r=0	P-valAsy	H0:r<=1	P-valAsy	Obs
DBOTR	DEXCHNR	Opt:1	0.447	0.375	70.170	3.29578D-08 **	31.041	8.70270D-07 **	70
DBOT	DEXCHN	Opt:1	0.480	0.312	67.853	6.17205D-08 **	24.688	0.000018677 **	70
DFIN	DDRATE	Opt:1	0.714	0.282	104.390	3.11449D-12 **	21.875	0.000072589 **	70
DFIN	DEXCHNR	Opt:2	0.560	0.201	65.910	1.04474D-07 **	14.131	0.0030411 **	69
DBOP	DDRATE	Opt:1	0.623	0.302	88.179	2.51147D-10 **	23.755	0.000029306 **	70
DBOP	DEXCHNR	Opt:2	0.632	0.254	81.516	1.52598D-09 **	18.455	0.00037827 **	69
DDIR	DDRATE	Opt:1	0.410	0.310	59.332	6.20342D-07 **	24.531	0.000020144 **	70
DDIR	DEXCHNR	Opt:1	0.419	0.330	62.242	2.82051D-07 **	26.426	8.07358D-06 **	70
DEXPN	DEXCHNR	Opt:2	0.466	0.214	54.718	2.16373D-06 **	15.193	0.0018237 **	69
DEXPN	DDRATE	Opt:2	0.472	0.152	50.639	6.53129D-06 **	10.366	0.018429 **	69
DEXPN	DFIN	Opt:2	0.536	0.454	86.508	3.94910D-10 **	38.081	2.90979D-08 **	69
DEXPN	DBOTR	Opt:2	0.455	0.325	62.964	2.31982D-07 **	24.742	0.000018198 **	69
DINVIN	DEXCHNR	Opt:2	0.452	0.211	52.812	3.62538D-06 **	14.898	0.0021018 **	69
DINVIN	DDRATE	Opt:2	0.423	0.188	47.793	0.000014115 **	13.135	0.0049088 **	69
DINVOUT	DEXCHNR	Opt:1	0.670	0.386	105.342	2.40716D-12 **	32.192	4.99303D-07 **	70
DINVOUT	DDRATE	Opt:1	0.679	0.313	99.747	1.09528D-11 **	24.824	0.000017486 **	70
DEXCHNR	DDRATE	Opt:1	0.392	0.328	59.043	6.70765D-07 **	26.248	8.79630D-06 **	70
DDRATE	DEXCHN	Opt:1	0.381	0.304	55.602	1.70314D-06 **	23.901	0.00002731**	70

Thailand

Variables:		Num lags	Eigval1	Eigval2	H0:r=0	P-valAsy	H0:r<=1	P-valAsy	Obs
DBOTR	DEXCHNR	Opt:2	0.394	0.179	47.453	0.000015475 **	13.412	0.0042969 **	74
DBOT	DEXCHN	Opt:1	0.515	0.339	80.733	1.88636D-09 **	29.377	1.94300D-06 **	75
DFIN	DDRATE	Opt:1	0.346	0.242	49.838	8.11261D-06 **	19.684	0.00020904 **	75
DFIN	DEXCHNR	Opt:2	0.370	0.201	46.673	0.000019115 **	15.268	0.0017583 **	74
DBOP	DDRATE	Opt:1	0.447	0.232	60.822	4.14355D-07 **	18.737	0.0003301 **	75
DBOP	DEXCHNR	Opt:2	0.419	0.196	51.810	4.75553D-06 **	14.859	0.0021415 **	74
DDIR	DDRATE	Opt:1	0.240	0.148	30.888	0.0013718 **	11.389	0.011327 **	75
DDIR	***DEXCHNR***	***Opt:2***	***0.164***	***0.076***	***17.593***	***0.055828*** **	***5.382***	***0.16007***	***74***
DEXPN	DEXCHNR	Opt:2	0.622	0.154	77.445	4.59629D-09 **	11.335	0.011622 **	74
DEXPN	DDRATE	Opt:2	0.598	0.169	74.525	1.01330D-08 **	12.613	0.0063067 **	74
DEXPN	DFIN	Opt:2	0.646	0.233	88.672	2.19800D-10 **	18.012	0.00046832 **	74
DEXPN	DBOTR	Opt:2	0.623	0.323	92.844	7.10189D-11 **	26.543	7.62973D-06 **	74
DINVIN	DEXCHNR	Opt:2	0.554	0.141	65.174	1.27517D-07 **	10.312	0.018905 **	74
DINVIN	DDRATE	Opt:1	0.565	0.222	76.895	5.33384D-09 **	17.808	0.00051675 **	75
DINVOUT	DEXCHNR	Opt:2	0.641	0.157	81.319	1.60979D-09 **	11.622	0.010137 **	74
DINVOUT	DDRATE	Opt:1	0.632	0.174	84.606	6.61010D-10 **	13.602	0.0039225 **	75
DEXCHNR	***DDRATE***	***Opt:2***	***0.221***	***0.098***	***24.060***	***0.0086515*** **	***7.048***	***0.080101***	***74***
DDRATE	DEXCHN	Opt:1	0.421	0.250	59.197	6.43450D-07 **	20.410	0.00014726 **	75

*Note: ** indicate statistical significance at 5%.. Each observation has differing observations because of the selected significant lags.*

E.3. Bi-variate Johansen (trace) Co-integration Results for Malaysia, 1981:3 to 1999:3

Malaysia									
Variables:		Num lags	Eigval1	Eigval2	H0:r=0	P-valAsy	H0:r<=1	P-valAsy	Obs
DDIR	DDRATE	Opt:1	0.322	0.250	45.341	0.000027419 **	19.281	0.00025383 **	71
DDIR	DEXCHNR	Opt:2	0.349	0.203	41.996	0.000067834 **	14.502	0.002543 **	70
DEXPN	DEXCHNR	Opt:2	0.957	0.204	216.590	1.98521D-25 **	14.586	0.0024431 **	70
DEXPN	DDRATE	Opt:2	0.956	0.194	213.985	4.02047D-25 **	13.764	0.0036276 **	70
DEXPN	DFIN	Opt:2	0.958	0.307	226.631	1.30900D-26 **	23.485	0.000033374 **	70
DBUDGET	DDRATE	Opt:2	0.893	0.192	156.707	2.19039D-18 **	13.683	0.0037727 **	70
DBUDGET	DEXCHNR	Opt:2	0.905	0.210	165.418	2.07056D-19 **	15.072	0.001933 **	70
DEXCHNR	DDRATE	Opt:1	0.302	0.241	42.577	0.000057962 **	18.450	0.00037908 **	71

APPENDIX F: Multi-variate Johensen (trace) Co-integration Results for the East Asian Countries.

Indonesia

Variables:			lags	H0:r=0	P-valAsy	Sig	H0:r<=1	P-valAsy	sig	H0:r<=2	P-valAsy	sig	Obs
DBOTR	DEXCHNR	-	2	76.58	5.816D-09	**	34.38	1.736D-07	**	-	-		70
DBOT	DEXCHN	-	2	71.11	2.554D-08	**	26.77	6.831D-06	**	-	-		70
DFIN	DEXCHNR	DDRATE	2	132.80	7.799D-17	**	46.87	0.00	**	6.27	0.11		70
DBOP	DEXCHNR	DDRATE	2	116.13	2.257D-14	**	51.80	4.765D-06	**	6.92	0.08		70
DDIR	DDRATE	DEXCHNR	2	68.88	2.138D-07	**	17.24	0.06		5.70	0.14		70
DINVIN	DEXCHNR	DDRATE	2	88.97	2.308D-10	**	20.95	0.02	**	1.12	0.68		70
DINVOUT	DEXCHNR	DDRATE	2	30.37	0.07		12.11	0.27		0.10	0.79		24
DEXCHNR	DDRATE	-	2	50.00	7.755D-06	**	2.28	0.52		-	-		70
DDRATE	DEXCHN	-	2	30.63	0.00	**	1.71	0.60		-	-		70
Korea													
DBOTR	DEXCHNR	-	3	39.81	0.00	**	11.50	0.01	**	-	-		68
DBOT	DEXCHN	-	2	55.54	1.729D-06	**	21.30	0.00	**	-	-		69
DFIN	DEXCHNR	DDRATE	2	111.49	1.091D-13	**	54.13	2.536D-06	**	19.74	0.00	**	69
DBOP	DEXCHNR	DDRATE	2	132.69	8.090D-17	**	54.35	2.392D-06	**	18.48	0.00	**	69
DDIR	DEXCHNR	DDRATE	2	91.07	1.128D-10	**	47.70	0.00	**	8.82	0.04	**	69
DEXPN	DEXCHNR	DDRATE	2	151.30	1.443D-19	**	53.09	3.363D-06	**	17.38	0.00	**	69
DEXPN	DFIN	DBOTR	2	150.72	1.759D-19	**	50.46	6.861D-06	**	16.92	0.00	**	69
DINVIN	DEXCHNR	DDRATE	2	106.39	6.190D-13	**	59.37	6.135D-07	**	23.11	0.00	**	69
DINVOUT	DEXCHNR	DDRATE	2	94.62	3.383D-11	**	50.29	7.182D-06	**	18.21	0.00	**	69
DDRATE	DEXCHNR	-	2	59.24	6.360D-07	**	20.96	0.00	**	-	-		69
DDRATE	DEXCHN	-	2	56.73	1.256D-06	**	19.35	0.00	**	-	-		69
Malaysia													
DDIR	DDRATE	DEXCHNR	1	67.69	3.201D-07	**	41.47	0.00	**	17.08	0.00	**	71
DEXPN	DEXCHNR	DDRATE	2	222.76	4.059D-30	**	29.47	0.00	**	12.42	0.01	**	70
DEXPN	DFIN	-	2	226.63	1.309D-26	**	23.49	0.00	**	-	-		70
DBUDGET	DDRATE	DEXCHNR	2	174.35	5.702D-23	**	29.48	0.00	**	12.17	0.01	**	70
DEXCHNR	DDRATE	-	1	42.58	0.00	**	18.45	0.00	**	-	-		71
DEXCHN	DDRATE	-	1	42.66	0.00	**	19.38	0.00	**	-	-		71
Philppines													
DBOTR	DEXCHNR	-	1	70.17	3.295D-08	**	31.04	8.702D-07	**	-	-		70
DBOT	DEXCHN	-	1	67.85	6.172D-08	**	24.69	0.00	**	-	-		70
DFIN	DEXCHNR	DDRATE	1	126.64	6.323D-16	**	46.22	0.00	**	20.90	0.00	**	70
DBOP	DEXCHNR	DDRATE	2	85.31	8.00D-10	**	27.84	0.00	**	9.49	0.03	**	69
DDIR	DEXCHNR	DDRATE	1	91.57	9.526D-11	**	51.13	5.716D-06	**	24.56	0.00	**	70
DEXPN	DDRATE	DEXCHNR	1	95.58	2.440D-11	**	50.43	6.90D-06	**	20.65	0.00	**	70
DEXPN	DFIN	DBOTR	1	151.29	1.452D-19	**	69.90	3.545D-08	**	31.32	7.59D-07	**	70
DINVIN	DDRATE	DEXCHNR	2	63.54	1.310D-06	**	26.60	0.00	**	7.94	0.06		69
DINVOUT	DEXCHNR	DDRATE	1	48.23	0.00	**	25.85	0.01	**	8.99	0.03	**	24
DDRATE	DEXCHNR	-	1	59.04	6.707D-07	**	26.25	8.796D-06	**	-	-		70
DDRATE	DEXCHN	-	1	55.60	1.703D-06	**	23.90	0.00	**	-	-		70
Thailand													
DBOTR	DEXCHNR	-	2	47.45	0.00	**	13.41	0.00	**	-	-		74
DBOT	DEXCHN	-	1	80.73	1.886D-09	**	29.38	1.943D-06	**	-	-		75
DFIN	DEXCHNR	DDRATE	2	59.99	4.387D-06	**	27.20	0.00	**	8.43	0.04	**	74
DBOP	DEXCHNR	DDRATE	2	64.72	8.784D-07	**	26.48	0.00	**	9.36	0.03	**	74
DDIR	DEXCHNR	DDRATE	2	28.1524	0.11294		14.5185	0.13951		5.6589	0.14292		70
DEXPN	DDRATE	DEXCHNR	2	82.31	2.218D-09	**	22.42	0.01	**	6.65	0.09		74
DEXPN	DFIN	DBOTR	2	112.78	7.043D-14	**	44.85	0.00	**	16.35	0.00	**	74
DINVIN	DDRATE	DEXCHNR	2	75.99	1.907D-08	**	22.19	0.01	**	5.59	0.15		74
DINVOUT	DEXCHNR	DDRATE	2	89.49	1.936D-10	**	18.22	0.05	**	7.01	0.08		74
DDRATE	DEXCHNR	-	2	24.06	0.01	**	7.05	0.08		-	-		74
DDRATE	DEXCHN	-	1	59.20	6.434D-07	**	20.41	0.00	**	-	-		75

APPENDIX G: VAR and ECM Regression Results for East Asian Countries; 1982:2 to 1999:3

G.1 VAR and ECM Regression Results for Indonesia and Philippines; 1982:2 to 1999:3

Indonesia Number of observations: 70

Dep. Var.	Ind. Vars		ECT coeff.	P-value	sig.	R-sq.	Adj. R	s-r Effect (Independent var. coefficient sign
DBOT	DEXCHN		-0.273	[.037]	*	0.299	0.220	
DBOTR	DEXCHNR		-0.304	[.020]	*	0.295	0.216	
			F - stat	P-value	sig.	R-sq	Adj. R	s-r Effect (significant independent variables)
DFIN	SDEXCHNR	SDRATE	5.311	[.000]	**	0.552	0.448	DFIN & DEXCHNR
SDEXCHNR	SDRATE	DFIN	54.452	[.000]	**	0.927	0.910	DFIN, DRATE & DEXCHNR
SDRATE	DFIN	SDEXCHNR	38.040	[.000]	**	0.898	0.875	DDRATE & DEXCHNR
SDINVIN	SDEXCHNR	SDRATE	33.046	[.000]	**	0.894	0.867	DINVIN & DRATE(-3)
SDEXCHNR	SDRATE	SDINVIN	39.781	[.000]	**	0.910	0.887	DEXCHNR(-1), SDRATE(-3) & DINVIN
SDRATE	SDINVIN	SDEXCHNR	40.363	[.000]	**	0.904	0.881	DDRATE, DEXCHNR(-1) & DINVIN
DBOP	SDEXCHNR	SDRATE	4.702	[.000]	**	0.522	0.411	DBOP & SDRATE(-2)
SDEXCHNR	SDRATE	DBOP	41.258	[.000]	**	0.905	0.884	C, DEXCHNR(-1), DDRATE & DBOP
SDRATE	DBOP	SDEXCHNR	39.647	[.000]	**	0.893	0.870	DDRATE(-1) & DBOP(-2)
SDIR	SDEXCHNR	SDRATE	5.800	[.000]	**	0.596	0.493	DDIR(-1) & SDRATE(-3)
SDEXCHNR	SDRATE	SDIR	15.186	[.000]	**	0.794	0.742	DEXCHNR(-1), DDRATE & DDIR
SDRATE	SDIR	SDEXCHNR	32.080	[.000]	**	0.891	0.863	DDRATE, DDIR & DEXCHNR
SDEXCHNR	SDRATE		13.605	[.000]	**	0.671	0.622	DDRATE & DEXCHNR
SDRATE	SDEXCHNR		50.916	[.000]	**	0.884	0.867	DDRATE & DEXCHNR
SDEXCHN	SDRATE		19.169	[.000]	**	0.742	0.703	DDRATE & DEXCHN
SDRATE	SDEXCHN		48.877	[.000]	**	0.880	0.862	DDRATE & DEXCHN

Philippines Number of observations: 71

Dept. Var.	Indept. Var		ECT coef	P-val	sig.	R-sqd	Adj. R	s-r Effect (Independent var. sign. Lags)
DDRATE	DFIN		-0.114	[.009]	**	0.223	0.137	DFIN(-1)
DBOP	DEXCHNR		-0.724	[.006]	**	0.515	0.461	DEXCHNR(-1)
DBOP	DDRATE		-0.729	[.002]	**	0.443	0.381	
DDRATE	DBOP		-0.108	[.017]	*	0.222	0.135	DBOP(-1)
DEXCHNR	DDIR		-0.123	[.013]	*	0.142	0.046	
DEXCHNR	DEXPN		-0.507	[.000]	**	0.308	0.231	DEXCHNR(-1), (-3)
DEXPN	DDRATE		0.079	[.003]	**	0.537	0.486	DEXPN(-1), (-2), (-3)
DEXPN	DFIN		0.080	[.001]	**	0.572	0.524	DEXPN(-1), (-2), (-3) DFIN(-1), (-2)
DEXPN	DBOTR		0.057	[.008]	**	0.543	0.492	DEXPN(-1), (-3)
DDRATE	DBUDGET		-0.095	[.021]	*	0.270	0.189	DBUDGET(-2)
Dept. Var.	Indept. Var		F stat.	P-Val	sig.	R-sqd	Adj. R	s-r Effect (Independent var. sign. Lags)
DINVIN	SDEXCHNR	SDRATE	5.041	[.000]	**	0.558	0.447	INVIN(-1), (-2), SDEXCHNR, (-1), SDRATE
SDEXCHNR	SDRATE	DINVIN	5.879	[.000]	**	0.595	0.494	DEXCHNR(-1), DINVIN(-1)
SDRATE	DINVIN	SDEXCHNR	7.655	[.000]	**	0.657	0.571	DDRATE(-1)

G.2 VAR and ECM Regression Results for Thailand, Korea and Malaysia; 1982:2 to 1999:3

Thailand Number of observations: 71

Dept. Var.	Indept. Var	ECT coef	P-val	sig.	R-sqd	Adj. R	s-r Effect (Independent var. sign. Lags)
DFIN	DEXCHNR	-0.150	[.048]	*	0.153	0.059	
DDRATE	DFIN	-0.124	[.024]	*	0.156	0.062	
DBOP	DEXCHNR	-0.253	[.050]	*	0.258	0.175	
DBOP	DDRATE	-0.326	[.007]	**	0.173	0.081	
DEXCHNR	DEXPN	-0.311	[.000]	**	0.386	0.318	
DEXPN	DFIN	0.055	[.026]	*	0.528	0.475	
DFIN	DEXPN	-0.199	[.017]	*	0.200	0.111	
DDRATE	DBUDGET	-0.118	[.024]	*	0.290	0.211	

Dept. Var.	Indept. Var		F stat.	P-Val	sig	R-sqd	Adj. R-sq	s-r Effect (Independent var. sign. Lags)
DINVIN	SDEXCHNR	SDRATE	9.243	[.000]	**	0.698	0.622	DINVIN(-1), (-2), (-3), SDEXCHNR(-2)
SDEXCHNR	SDRATE	DINVIN	16.820	[.000]	**	0.808	0.760	DEXCHNR(-1), DINVIN, (-1)
SDRATE	DINVIN	SDEXCHNR	6.588	[.000]	**	0.622	0.528	DINVIN(-3)
DINVOUT	SDEXCHNR	SDRATE	6.472	[.000]	**	0.618	0.523	DEXCHNR, SDEXCHNR, (-1), SDRATE(-3)
SDEXCHNR	SDRATE	DINVOUT	9.711	[.000]	**	0.708	0.635	DEXCHNR(-1), SDEXCHNR(-3), DINVOUT(-1)
SDRATE	DINVOUT	SDEXCHNR	8.954	[.000]	**	0.691	0.614	INVOUT, DINVOUT, (-1), (-2), SDEXCHNR(-3)
SDEXCHNR	SDRATE	SDIR	10.196	[.000]	**	0.718	0.648	DEXCHNR(-1), SDEXCHNR(-2), SDIR(-2)
SDRATE	SDIR	SDEXCHNR	6.547	[.000]	**	0.621	0.526	
SDIR	SDEXCHNR	SDRATE	3.589	[.000]	**	0.473	0.341	SDIR(-1), SDEXCHNR
SDEXCHNR	SDRATE		10.958	[.000]	**	0.618	0.561	DEXCHNR(-1), SDEXCHNR(-3)
SDRATE	SDEXCHNR		8.999	[.000]	**	0.570	0.507	

Korea Number of observations: 71

Dep. Var	Indept. Var.	ECT coeff.	P-value		R-sqd.	Adj. R-sq
DFIN	DEXCHNR	-0.503	[.002]	**	0.355	0.282
DFIN	DDRATE	-0.531	[.002]	**	0.337	0.263
DDRATE	DFIN	-0.097	[.009]	**	0.311	0.233
DINVIN	DDRATE	0.378	[.000]	**	0.410	0.343
DDRATE	DINVIN	-0.097	[.013]	*	0.263	0.180
DEXCHNR	DINVOUT	-0.240	[.011]	*	0.266	0.184
DDRATE	DINVOUT	-0.091	[.028]	*	0.251	0.167
DBOP	DDRATE	-0.635	[.011]	*	0.414	0.348
DDRATE	DBOP	-0.097	[.010]	**	0.299	0.220
DDIR	DEXCHNR	-0.121	[.027]	*	0.523	0.469
DDRATE	DDIR	-0.090	[.027]	*	0.288	0.208
DEXCHNR	DEXPN	-0.449	[.001]	**	0.387	0.318
DEXPN	DDRATE	0.102	[.016]	*	0.714	0.681
DDATE	DEXPN	-0.090	[.034]	*	0.246	0.161
DEXPN	DFIN	0.095	[.006]	**	0.775	0.749
DFIN	DEXPN	-0.589	[.000]	**	0.467	0.407
DEXPN	DBOTR	0.098	[.010]	*	0.715	0.683
DBOTR	DEXPN	-0.155	[.030]	*	0.290	0.209
DBUDGET	DEXCHNR	-0.561	[.034]	*	0.880	0.867
DDRATE	DBUDGET	-0.100	[.010]	**	0.265	0.182
DDRATE	DEXCHNR	-0.083	[.041]	*	0.293	0.213
DDRATE	DEXCHN	-0.096	[.009]	**	0.322	0.245

Malaysia Number of observations: 71

Dept. Var.	Indept. Var.	ECT coeff.	P-val.	sig.	R-sqd.	Adj. R-sq
DDIR	DEXCHNR	-0.092	[.041]	*	0.296	0.217
DEXPN	DDRATE	0.152	[.030]	*	0.945	0.939
DDRATE	DEXPN	-0.092	[.032]	*	0.188	0.098
DEXPN	DFIN	0.134	[.005]	**	0.950	0.945
DFIN	DEXPN	-0.571	[.000]	**	0.438	0.375
DDRATE	DBUDGET	-0.081	[.019]	*	0.206	0.118
DEXCHN	DDRATE	0.127	[.018]	*	0.151	0.057

APPENDIX H: Panel Data Regional Analysis Results

H.1.Effects of Exchange Rate Regime on BOP Time Series Panel Data for Indonesia, Korea, Malaysia, Philippines and Thailand Respectively; 1981 to 1999

Model 1

Dept. Var. = Y	**DEXCHN**		**DBOT**		**DBOTR**		**DEXCHNR**	
Indept. Var. =X	**DBOT**		**DEXCHN**		**DEXCNR**		**DBOTR**	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Y(-1)	-0.143407	[.725]	-1.05728	**[.000]	-0.76312	**[.000]	-0.365976	**[.039]
DY(-1)	0.359827	[.711]	0.91322	**[.004]	0.610345	**[.004]	-0.22931	[.342]
X	-2.16E-08	[.053]	-5.02E+06	**[.026]	-91890.9	[.439]	4.23E-08	[.737]
DX	1.40E-08	[.336]	4.07E+06	**[.010]	96639.3	[.332]	-3.56E-08	[.748]
DX(-1)	1.11E-08	[.365]	1.10E+07	**[.015]	86375.1	[.391]	-5.49E-08	[.686]
DUMMY1-Indo	447.134	[.424]	3.27E+09	[.265]	-805882	[.986]	140.339	**[.028]
DUMMY2-Kor	106.315	[.736]	2.61E+09	[.295]	1.06E+07	[.763]	51.3833	[.154]
DUMMY3-Mal	-31.416	[.235]	-1.21E+09	[.289]	-8.64E+06	[.397]	1.20126	[.664]
DUMMY4-Thai	-43.709	[.132]	-1.99E+09	**[.017]	-3.05E+07	**[.011]	4.22226	[.522]
DUMMY5-Phil	-88.7229	[.111]	-4.30E+09	**[.009]	-3.55E+07	**[.007]	4.06563	[.565]

Model 2 **Model 5**

Dept. Var. = Y	**DFIN**		**DDRATE**		**DEXCHNR**		**DDRATE**	
Indept. Var. =X	**DDRATE**		**DFIN**		**DDRATE**		**DEXCHNR**	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Y(-1)	-0.763862	**[.011]	-0.560577	**[.000]	-0.440034	**[.003]	-0.513745	**[.001]
DY(-1)	0.44376	**[.016]	0.036949	[.867]	-0.154228	[.472]	-0.054326	[.808]
X	8.86E+07	[.500]	1.90E-10	**[.002]	-0.616537	[.605]	-8.93E-03	[.593]
DX	-1.42E+08	[.249]	-2.10E-10	**[.007]	2.21388	[.077]	0.014577	[.369]
DX(-1)	-3.46E+08	[.056]	-1.39E-10	[.088]	-5.56938	**[.016]	0.010589	[.354]
DUMMY1-Indo	2.62E+09	**[.047]	4.0896	**[.002]	183.258	**[.001]	8.43137	[.275]
DUMMY2-Kor	3.01E+09	[.106]	-1.60967	**[.041]	60.3166	**[.047]	0.815182	[.794]
DUMMY3-Mal	2.56E+09	[.112]	-1.62304	**[.016]	0.546143	[.903]	-0.774427	[.159]
DUMMY4-Thai	2.00E+09	**[.039]	1.71752	**[.024]	7.9657	[.137]	2.24911	**[.007]
DUMMY5-Phil	3.18E+09	[.083]	0.470284	[.383]	5.72424	[.212]	1.45036	**[.047]

Model 3a

Dept. Var. = Y	**DBOP**		**DDRATE**		**DBOP**		**DEXCHNR**	
Indept. Var. =X	**DDRATE**		**DBOP**		**DEXCHNR**		**DBOP**	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Y(-1)	-1.7354	**[.001]	-0.541556	**[.000]	-1.62573	**[.001]	-0.37161	**[.030]
DY(-1)	0.72515	**[.031]	0.067273	[.749]	0.657272	**[.029]	-0.223201	[.351]
X	2.82E+08	**[.035]	3.77E-10	**[.005]	1.68E+06	[.912]	4.71E-10	[.819]
DX	-1.85E+08	[.182]	-3.37E-10	**[.002]	-6.10E+06	[.614]	-1.07E-09	[.544]
DX(-1)	-3.67E+08	[.111]	-3.13E-10	**[.003]	-794507	[.914]	-1.00E-09	[.440]
DUMMY1-Indo	-1.25E+09	[.179]	4.57131	**[.000]	-3.24E+08	[.959]	140.264	**[.018]
DUMMY2-Kor	4.72E+09	[.067]	-1.30401	[.091]	3.80E+09	[.427]	52.3437	[.139]
DUMMY3-Mal	3.60E+09	**[.020]	-1.37269	**[.046]	2.57E+09	**[.036]	0.091286	[.976]
DUMMY4-Thai	3.78E+08	[.512]	2.00632	**[.011]	8.84E+08	[.139]	1.85524	[.306]
DUMMY5-Phil	1.14E+09	[.467]	1.03399	[.061]	1.63E+09	[.293]	0.999263	[.756]

Model 3b

Dept. Var. = Y Indept. Var. =X	DDIR DEXCHNR		DEXCHNR DDIR		DDIR DDRATE		DDRATE DDIR	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Y(-1)	0.054368	[.626]	-0.447573	**[.010]	0.04827	[.767]	-0.612299	**[.000]
DY(-1)	0.021609	[.958]	-0.194816	[.400]	0.028109	[.951]	0.036709	[.882]
X	-1.66E+07	[.250]	-1.26E-09	**[.006]	1.67E+08	[.407]	9.05E-11	[.061]
DX	8.46E+06	[.459]	-2.21E-11	[.980]	-1.46E+08	[.354]	-7.97E-11	[.218]
DX(-1)	9.11E+06	[.295]	-2.53E-10	[.682]	-3.30E+07	[.791]	-1.32E-10	[.161]
DUMMY1-Indo	7.40E+09	[.192]	184.814	**[.003]	-5.89E+08	[.399]	4.6117	**[.001]
DUMMY2-Kor	5.94E+09	[.157]	89.4361	**[.020]	3.46E+09	**[.049]	-2.1622	[.054]
DUMMY3-Mal	7.42E+08	[.594]	18.9035	**[.006]	1.26E+09	[.621]	-2.13363	**[.044]
DUMMY4-Thai	5.25E+08	[.286]	7.60091	**[.004]	-2.79E+07	[.950]	2.12574	**[.017]
DUMMY5-Phil	1.05E+09	[.354]	23.2224	**[.005]	6.06E+08	[.687]	0.479391	[.539]

Model 4a

Dept. Var. = Y Indept. Var. =X	DEXPN DEXCHNR		DEXCHNR DEXPN		DEXPN DDRATE		DDRATE DEXPN	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Y(-1)	0.102511	[.073]	-0.619256	**[.000]	0.105629	**[.027]	-0.456001	**[.000]
DY(-1)	0.507354	[.127]	-0.118359	[.526]	0.707629	**[.000]	0.08887	[.521]
X	-2.84E+10	[.161]	-1.51E-12	[.098]	3.06E+11	**[.003]	-4.46E-14	[.179]
DX	2.85E+10	[.142]	1.53E-12	[.263]	5.17E+11	**[.002]	6.08E-13	**[.001]
DX(-1)	2.45E+09	[.862]	3.49E-13	[.888]	-1.59E+11	[.357]	-4.40E-13	**[.008]
DUMMY1-Indo	1.32E+13	[.176]	311.934	**[.000]	-2.87E+12	[.081]	3.7875	**[.001]
DUMMY2-Kor	4.10E+12	[.297]	146.246	**[.002]	-1.37E+12	[.308]	-0.061515	[.953]
DUMMY3-Mal	1.13E+10	[.273]	0.327734	**[.001]	4.33E+11	[.293]	-0.698611	[.152]
DUMMY4-Thai	1.67E+11	[.187]	3.71411	**[.002]	-1.29E+12	**[.023]	1.90077	**[.002]
DUMMY5-Phil	1.23E+11	[.260]	3.42289	**[.001]	-7.91E+11	[.173]	1.20323	[.053]

Model 4b

Dept. Var. = Y Indept. Var. =X	DEXPN DFIN		DFIN DEXPN		DEXPN DBOTR		DBOTR DEXPN	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Y(-1)	0.134928	[.053]	-0.797183	**[.007]	0.13198	[.067]	-0.762369	**[.000]
DY(-1)	0.517023	[.155]	0.469999	**[.006]	0.5368	[.165]	0.60554	**[.001]
X	-29.0389	[.504]	1.37E-04	[.076]	1529.69	[.722]	1.89E-07	[.876]
DX	-75.7989	[.531]	-3.03E-04	[.106]	220.929	[.974]	6.73E-08	[.972]
DX(-1)	-29.8646	[.752]	-2.87E-04	[.068]	-1148.99	[.861]	-3.14E-07	[.903]
DUMMY1-Indo	1.31E+10	[.993]	6.56E+08	[.795]	7.57E+09	[.996]	-4.80E+07	[.188]
DUMMY2-Kor	-1.90E+12	[.165]	3.55E+08	[.797]	-1.97E+12	[.180]	-1.28E+07	[.571]
DUMMY3-Mal	3.21E+10	[.862]	2.23E+09	[.091]	1.56E+10	[.877]	-8.65E+06	[.389]
DUMMY4-Thai	4.38E+10	[.741]	1.99E+09	**[.044]	5.28E+10	[.808]	-3.10E+07	**[.008]
DUMMY5-Phil	2.78E+09	[.993]	3.42E+09	[.075]	3.85E+10	[.868]	-3.59E+07	**[.005]

H.2.Effects of Exchange Rate Regime on BOP Time Series Panel Data for Kenya, Tanzania and Uganda Respectively; 1981 to 1999

Model 1

Dept. Var. =Y	DEXCHN		DBOT		DBOTR		DEXCHNR	
Indept. Var.=X	DBOT		DEXCHN		DEXCHNR		DBOTR	
	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value
Y(-1)	-0.097505	[.154]	-0.493722	**[.005]	-0.350156	[.135]	0.024733	[.771]
DY(-1)	0.500301	[.062]	0.220845	[.226]	-1.55E-03	[.987]	0.081255	[.667]
X	-1.41E-07	**[.020]	-324134	**[.009]	-568.585	[.980]	4.71E-08	[.506]
DX	4.87E-08	[.216]	-370906	[.159]	190957	[.224]	6.74E-08	[.420]
DX(-1)	4.71E-08	[.244]	730717	**[.001]	71132.4	[.369]	9.89E-09	[.924]
DUMMY1-Ken	-77.0855	**[.024]	-2.72E+08	**[.037]	-3.93E+06	[.480]	2.79087	[.545]
DUMMY2-Tan	-81.7786	**[.040]	-3.95E+08	**[.004]	-1.79E+07	[.436]	23.0744	[.429]
DUMMY3-Uga	26.7247	[.214]	-1.09E+08	**[.024]	-2.29E+07	[.306]	62.5701	[.410]

Model 2 **Model 3**

Dept. Var. =Y	DFIN		DDRATE		DEXCHNR		DDRATE	
Indept. Var.=X	DDRATE		DFIN		DDRATE		DEXCHNR	
	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value
Y(-1)	-0.563008	**[.004]	-0.335861	**[.002]	0.032459	[.584]	-0.292082	**[.003]
DY(-1)	0.108497	[.642]	7.54E-03	[.957]	0.087147	[.629]	-0.051196	[.652]
X	-726588	[.591]	-6.39E-09	[.624]	-0.1534	[.884]	-8.84E-03	**[.025]
DX	-719531	[.749]	2.85E-10	[.982]	0.147025	[.901]	8.73E-03	[.614]
DX(-1)	718707	[.706]	-1.26E-09	[.914]	0.391929	[.729]	0.051023	**[.039]
DUMMY1-Ken	1.33E+08	**[.037]	6.65242	[.125]	3.50102	[.759]	4.91495	**[.020]
DUMMY2-Tan	6.30E+07	[.114]	4.82898	[.186]	20.0671	[.184]	5.24782	**[.045]
DUMMY3-Uga	9.56E+07	**[.016]	7.98871	**[.002]	59.3728	[.080]	7.61757	[.066]

Model 3a

Dept. Var. =Y	DBOP		DDRATE		DBOP		DEXCHNR	
Indept. Var.=X	DDRATE		DBOP		DEXCHNR		DBOP	
	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value
Y(-1)	-1.04955	**[.000]	-0.318542	**[.002]	-1.07857	**[.000]	0.024596	[.635]
DY(-1)	-5.43E-03	[.969]	0.07272	[.630]	8.10E-03	[.953]	0.093997	[.570]
X	323153	[.810]	-1.30E-08	[.533]	-43947.8	[.293]	-3.90E-08	[.648]
DX	88903.4	[.957]	1.52E-08	[.320]	-30764.7	[.835]	1.39E-08	[.840]
DX(-1)	664799	[.604]	-1.48E-08	[.197]	73173.4	[.628]	-1.59E-08	[.738]
DUMMY1-Ken	3.75E+07	[.370]	5.53682	**[.006]	4.41E+07	[.326]	4.02394	[.213]
DUMMY2-Tan	-3.28E+08	**[.000]	-0.026457	[.996]	-3.20E+08	**[.000]	9.19319	[.754]
DUMMY3-Uga	-5.03E+07	[.128]	6.36992	**[.022]	-1.81E+07	[.575]	59.4166	[.132]

Model 3b

Dept. Var. =Y Indept. Var.=X	DDIR DEXCHNR		DEXCHNR DDIR		DDIR DDRATE		DDRATE DDIR	
	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value	Coeff.	P-Value
Y(-1)	-0.092772	[.447]	-6.67E-03	[.898]	0.043119	[.617]	-0.303914	**[.014]
DY(-1)	-0.150282	[.512]	0.110865	[.473]	-0.170222	[.466]	0.011769	[.936]
X	194494	**[.005]	7.46E-08	[.223]	1.36E+06	[.226]	1.45E-10	[.985]
DX	-270612	**[.032]	-1.16E-07	[.196]	-790226	[.559]	4.88E-09	[.811]
DX(-1)	-295148	**[.013]	-2.77E-08	[.630]	-1.33E+06	[.477]	-2.60E-01	[.244]
DUMMY1-Ken	6.36E+07	[.326]	-23.283	[.295]	2.35E+06	[.960]	5.0626	[.178]
DUMMY2-Tan	1.80E+07	[.268]	18.1765	[.298]	2.83E+07	[.116]	4.63984	[.082]
DUMMY3-Uga	-2.26E+07	[.395]	66.7897	[.076]	1.42E+07	[.580]	7.35619	**[.012]

Model 4a

Dept. Var. =Y Indept. Var.=X	DEXPN DEXCHNR		DEXCHNR DEXPN		DEXPN DDRATE		DDRATE DEXPN	
Y(-1)	-0.625521	[.174]	-0.075333	[.526]	-0.193854	[.446]	-0.323867	**[.006]
DY(-1)	-0.036175	[.829]	0.186468	[.297]	-0.110022	[.592]	-0.028659	[.835]
X	5.99E+08	[.091]	8.78E-11	[.492]	4.04E+09	[.114]	-5.94E-12	[.092]
DX	-1.37E+09	[.126]	-1.63E-10	**[.000]	-2.67E+09	[.277]	6.28E-12	[.158]
DX(-1)	-3.52E+08	[.438]	-7.94E-11	[.541]	-2.99E+09	[.198]	2.14E-12	[.493]
DUMMY1-Ken	4.09E+10	[.141]	0.399306	[.952]	-2.00E+10	[.091]	5.53241	**[.012]
DUMMY2-Tan	2.75E+10	[.516]	37.3315	**[.029]	5.46E+10	[.194]	5.33762	[.082]
DUMMY3-Uga	-2.54E+10	[.689]	79.5834	**[.014]	4.65E+08	[.986]	9.24486	**[.002]

Modl 4b

Dept. Var. =Y Indept. Var.=X	DEXPN DFIN		DFIN DEXPN		DEXPN DBOTR		DBOTR DEXPN	
Y(-1)	-0.142367	[.529]	-0.644948	**[.001]	-0.215259	[.419]	-0.343766	[.142]
DY(-1)	-0.057253	[.758]	0.117256	[.611]	-0.058246	[.744]	5.18E-03	[.962]
X	-105.509	[.397]	1.65E-04	**[.029]	134.265	[.108]	3.84E-06	[.835]
DX	68.6037	[.547]	-6.50E-05	[.153]	-111.668	[.102]	5.93E-06	[.438]
DX(-1)	-58.2141	[.527]	-1.43E-04	**[.009]	-132.107	[.123]	5.17E-07	[.957]
DUMMY1-Ken	4.53E+10	[.294]	1.30E+08	**[.036]	2.97E+10	[.200]	-3.40E+06	[.573]
DUMMY2-Tan	8.20E+10	[.174]	2.92E+07	[.352]	9.98E+10	[.137]	-1.12E+07	[.566]
DUMMY3-Uga	6.86E+10	[.103]	2.52E+07	[.469]	1.14E+11	[.092]	-2.61E+06	[.857]

APPENDIX I: ANOVA Result for the East Asian and East African Panel Analysis

I.1. ANOVA Results of the Effects of Exchange Rate Regime on BOP Component; 1981 to 1999

			East Asian Region					East African Region				
Models	**Dept. Var./Y**	**Indept.Var. X**	**R-sq**	**Adj R-sq**	**F stat.**	**P-value**	**sig.**	**R-sq**	**Adj R-sq**	**F stat.**	**P-Value**	**sig.**
Model 1	DEXCHN	DBOT	0.149	0.054	1.562	[.141]		0.440	0.355	5.171	[.000]	**
	DBOT	DEXCHN	0.522	0.468	9.690	[.000]	**	0.282	0.172	2.575	[.025]	*
	DBOTR	DEXCNR	0.400	0.333	5.935	[.000]	**	0.402	0.311	4.411	[.001]	**
	DEXCHNR	DBOTR	0.258	0.175	3.093	[.003]	**	0.210	0.090	1.745	[.122]	
Model 2	DFIN	DDRATE	0.346	0.272	4.698	[.000]	**	0.232	0.115	1.982	[.078]	
	DDRATE	DFIN	0.380	0.310	5.439	[.000]	**	0.206	0.085	1.701	[.133]	
Model 3	DBOP	DDRATE	0.502	0.446	8.962	[.000]	**	0.572	0.507	8.771	[.000]	**
	DDRATE	DBOP	0.394	0.326	5.781	[.000]	**	0.343	0.243	3.430	[.005]	**
	DBOP	DEXCHNR	0.483	0.425	8.311	[.000]	**	0.574	0.509	8.845	[.000]	**
	DEXCHNR	DBOP	0.265	0.183	3.208	[.002]	**	0.196	0.074	1.602	[.159]	
	DDIR	DEXCHNR	0.112	0.012	1.122	[.357]		0.156	0.028	1.217	[.313]	
	DEXCHNR	DDIR	0.297	0.218	3.757	[.001]	**	0.215	0.095	1.795	[.111]	
	DDIR	DDRATE	0.093	-0.008	0.917	[.515]		0.064	-0.078	0.450	[.865]	
	DDRATE	DDIR	0.347	0.274	4.727	[.000]	**	0.264	0.152	2.358	[.038]	*
Model 4	DEXPN	DEXCHNR	0.794	0.771	34.312	[.000]	**	0.299	0.192	2.803	[.016]	*
	DEXCHNR	DEXPN	0.390	0.321	5.682	[.000]	**	0.339	0.239	3.375	[.005]	**
	DEXPN	DDRATE	0.875	0.860	61.990	[.000]	**	0.163	0.035	1.277	[.283]	
	DDRATE	DEXPN	0.637	0.596	15.578	[.000]	**	0.229	0.112	1.953	[.083]	
	DEXPN	DFIN	0.767	0.740	29.189	[.000]	**	0.089	-0.049	0.643	[.718]	
	DFIN	DEXPN	0.373	0.303	5.289	[.000]	**	0.293	0.185	2.723	[.019]	*
	DEXPN	DBOTR	0.760	0.734	28.225	[.000]	**	0.101	-0.036	0.735	[.643]	
	DBOTR	DEXPN	0.396	0.328	5.833	[.000]	**	0.385	0.292	4.118	[.001]	**
Model 5	DEXCHNR	DDRATE	0.347	0.273	4.720	[.000]	**	0.194	0.072	1.584	[.164]	
	DDRATE	DEXCHNR	0.348	0.275	4.748	[.000]	**	0.294	0.187	2.741	[.018]	*

Models are considered significantly similar if they have R^2 s of $\approx 30\%$ and an F-value significant at 5% significance level for both economic regions.

APPENDIX J: CHOW'S TEST; A COMPARATIVE ANALYSIS OF THE EAST ASIAN AND EAST AFRICAN

Dept	Indept	With dummy SSR1	SSR0	{(SSR0-SSR1) (K0-K1)}	{(SSR1) Obs-2(K0-K1)}	Calculated Chow's [F]	signf. 0.05
Model 1							
DEXCHN	BOT	15791800	15919700	25580	117849.2537	0.217056954	
DBOT	EXCHN	1.89731E+21	2.01093E+21	2.2724E+19	1.4159E+19	1.604912218	
DBOTR	EXCHNR	7.13409E+17	7.73683E+17	1.20548E+16	5.32395E+15	2.264259632	**
DEXCHNR	BOTR	612552.5932	699655.7159	17420.62453	4571.288009	3.810878794	**
Model 2							
DFIN	DDRATE	2.47277E+21	2.7038E+21	4.6206E+19	1.84535E+19	2.503914234	**
DDRATE	DFIN	6420.31739	6502.16763	16.370048	47.91281634	0.341663239	
Model 3							
DBOP	DDRATE	2.10082E+21	2.49486E+21	7.8808E+19	1.56778E+19	5.026738131	**
DDRATE	DBOP	6375.96306	6456.06044	16.019476	47.58181388	0.336672243	
DBOP	DEXCHNR	2.36297E+21	2.49721E+21	2.6848E+19	1.76341E+19	1.522504306	
DEXCHNR	DBOP	614199.4783	705082.3472	18176.57377	4583.578196	3.965586052	**
DIR	DEXCHNR	7.58237E+20	2.08883E+21	2.66119E+20	5.65849E+18	47.0300083	**
DEXCHNR	DIR	599577.006	704073.8447	20899.36773	4474.455269	4.670818341	**
DIR	DDRATE	2.03325E+21	2.09722E+21	1.2794E+19	1.51735E+19	0.84318013	
DDRATE	DIR	6408.81647	6566.09425	31.455556	47.82698858	0.657694681	
Model 4							
DEXPN	DEXCHNR	1.41046E+27	1.56683E+27	3.1274E+25	1.05258E+25	2.971169689	**
DEXCHNR	DEXPN	510286.4969	681090.4353	34160.78768	3808.108186	8.970540228	**
DEXPN	DDRATE	8.19188E+26	1.50221E+27	1.36604E+26	6.11334E+24	22.34528533	**
DDRATE	DEXPN	5803.23886	6005.6141	40.475048	43.30775269	0.93459128	
DEXPN	DFIN	1.57568E+27	1.60124E+27	5.112E+24	1.17588E+25	0.434738018	
DFIN	EXPN	2.3256E+21	2.5272E+21	4.032E+19	1.73552E+19	2.323219814	**
DEXPN	DBOTR	1.6418E+27	1.64335E+27	3.1E+23	1.22522E+25	0.025301498	
DBOTR	DEXPN	7.1784E+17	7.73494E+17	1.11308E+16	5.35701E+15	2.077798952	
Model 5							
DEXCHNR	DDRATE	576650.6546	698417.766	24353.42227	4303.363094	5.65916046	**
DDRATE	DEXCHNR	5824.57853	6151.51719	65.387732	43.46700396	1.504307315	

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