Chapter 3 Research methodology

3.1 Introduction

The behaviour of 12 economic indicators was studied for a five-year period (1993 – 1997) leading to the currency crisis in Malaysia in 1997. The indicators were selected from the literature where much work has been done in identifying determinants of currency crises. The main sources for selecting the macroeconomic indicators were Kaminsky, Lizondo & Reinhart (1997), Corsetti, Pesenti & Roubini (1998) and Frankel & Rose (1996). Several other sources were also consulted in selecting the economic indicators: Berg & Pattillo (1998), Radelet & Sacchs (1998) and Esquivel & Larrain (1998).

The 12 macroeconomic indicators selected for the analysis were:

1. sovereign solvency (Corsetti, Pesenti & Roubini, 1998)
2. GDP growth rates (Frankel & Rose, 1996)
3. investment efficiency (Corsetti, Pesenti & Roubini, 1998)
4. savings rates (Corsetti, Pesenti & Roubini, 1998)
5. inflation (Corsetti, Pesenti & Roubini, 1998)
6. openness of the economy (Corsetti, Pesenti & Roubini, 1998)
7. real exchange rate appreciation (Kaminsky, Lizondo & Reinhart, 1997)
8. banking and financial system (Kaminsky, Lizondo & Reinhart, 1997)
9. composition of capital inflow (Corsetti, Pesenti & Roubini, 1998)
10. export growth (Corsetti, Pesenti & Roubini, 1998)
11. foreign reserves (Kaminsky, Lizondo & Reinhart, 1997)
12. interest rates (Kaminsky, Lizondo & Reinhart, 1997)

The method used to analyse the behaviour of the selected economic indicators was trend analyses. The method was a variation of the signals approach developed by Kaminsky, Lizondo & Reinhart (1997).

The signals method of monitoring the behaviour of economic indicators involved developing a threshold level for each indicator. When this threshold level was breached, a signal was issued. The initial method of Kaminsky, Lizondo & Reinhart (1997) was bivariate, the threshold level of each indicator was measured separately. Later on this approach was modified to construct a composite index where each indicator was assigned a weight (Kaminsky, 1998).

The present paper adopted the signals method of Kaminsky, Lizondo & Reinhart (1997) but used trend analysis (regression analysis) instead of measuring threshold level to develop the signals. For each economic indicator analysed, a trend curve was plotted for a five-year period. A negative trend (negative slope) would signal a weak economic position especially that of the current account deficit. Conversely a positive trend would indicate a strong current account position. The results of all the indicators were then pooled together to give an overall economic position. An arbitrary figure of 75% was chosen as indicative of severe economic crisis and most likely to spook investor confidence making them most susceptible to a triggering event. In other words if three-quarters of the indicators showed a negative trend then a currency crisis was most likely to occur. However no investigation was made into time periods or limits for crises to occur.

Prior work in this field was confined to separate studies on identifying and analysing macroeconomic indicators, investor expectations and triggering events. This study attempts to expand the field of study by combining all three components into one superior model for predicting currency crises.

3.2. Definition of concepts and terms

3.2.1. Currency crisis

The definition described as 'macroeconomic policy induced crisis' by Radelet & Sacchs (1998) is adopted for this paper. A currency crisis is defined to occur if domestic currency expansion becomes inconsistent with the pegged exchange rate and results in currency depreciation, collapse of the exchange rate, loss of foreign exchange reserves and a recession.

The ultimate target of any predictor model is to predict the onset of an actual currency crisis and not false alarms (poor economic fundamentals but no crisis occurs).

3.2.2. Current account deficits

The current account deficit is given by the following identity:

Current account = trade balance + net factor income from abroad

The trade balance is the net exports i.e. exports minus imports. The net factor income is the income (interest) earned from foreign assets of domestic residents. Current account is therefore the income earned or debt incurred by trading with other nations of the world. A current account deficit means that the country incurred a net debt from international trade while a surplus indicates net earnings from international trade.

3.2.3. Unsustainable current account deficits

Current account deficits are unsustainable if the current macroeconomic conditions give rise to external sector crisis such as exchange rate crisis or a debt crisis. Current account deficits are sustainable if the deficits can be maintained without any crisis occurring.

Unsustainable current account deficits will cause investors to expect that the exchange rate will collapse and they will be motivated to exchange the domestic currency for foreign exchange thus contributing to the exchange rate collapse

3.2.4. Solvency and resource balance gap

The resource balance gap is the difference between the trade surplus needed to maintain the debt to GDP ratio (i.e. maintain current level of debt) and the current trade balance measured as a percentage of GDP

A widening resource balance gap is indicative of national insolvency. An increasing ratio of foreign debt to GDP with a negative trade balance would lead to unsustainability of the current account deficit (Corsetti, Pesenti & Roubini, 1998).

3.2.5. GDP growth rate

The GDP growth rate is the annual percentage change in GDP. It is given by the following equation:

GDP growth rate in 1997 = $(GDP_{1997} - GDP_{1996})/GDP_{1996} \times 100$

An increasing and high GDP growth rate indicates a slower foreign debt to GDP growth. Thus a high and positive GDP growth rate is indicative that the current account deficit is sustainable (Corsetti, Pesenti & Roubini, 1998).

3.2.6. Investment efficiency

There are 2 measures of investment efficiency:

1. The incremental capital output ratio (ICOR) which is given by the following equation:

   ICOR = investment rate / output growth = interest rate / GDP growth rate

2. Rate of investment in tradable sector

   This is the ratio of investment in the tradable sector to total investment. Alternatively the ratio of investment in the non-tradable sector such as property to total investment can also be used to determine investment inefficiency

   Investment inefficiency = $\text{Investment}_{\text{property}}$ / total investment X 100

High and increasing rates of investment efficiency are indicative of a sustainable current account deficit position (Corsetti, Pesenti & Roubini, 1998). However investments must be in areas that eventually lead to high productivity in traded sectors (thus allowing a country to gain future trade surpluses to pay off foreign debt) and returns on investment must be higher than the cost of capital (Corsetti, Pesenti & Roubini, 1998).

3.2.7. Savings rates

1. Public savings rate is given by:

   Public savings = tax revenue – government expenditure

   This is the budget surplus/deficit.

2. Private savings rate is given by:

   Private savings = household income – household expenditure (taxes and consumption)

   = investment

   Private savings is measured by corresponding consumption and investment indicators such as purchase of goods (cars, TVs, imports, loans, capital goods, houses, construction material etc.)

High private and public savings rates tend to support the sustainability of the current account deficit (Corsetti, Pesenti & Roubini, 1998). High savings is indicative of low expenditure rates, which in turn means higher capacity to pay off foreign debt.

3.2.8. Inflation

Inflation is measured as the annual percentage change in consumer price index. The consumer price index is constructed by the government and is chosen to reflect the purchasing pattern of residents.

High inflation rates may signal poor macroeconomic policies and point towards seigniorage revenues that in turn points towards an unsustainable current account deficit. High inflation rates signal that the exchange rate is exposed to speculative attacks (Corsetti, Pesenti & Roubini, 1998).

3.2.9. Openness of the economy

The openness of the economy is given by the following equation:

$$\text{Openness} = \left(\frac{\text{Exports} + \text{Imports}}{2}\right) / \text{GDP} \times 100$$

Openness indicate how integrated the national economy is to the global economy. Open economies tend to support current account deficits because export revenues can support the debt obligations and international links make a crisis costly, both politically and economically (Corsetti, Pesenti & Roubini, 1998)

3.2.10. Real exchange rate appreciation

Real exchange rate is the nominal exchange rates adjusted for inflation. It is given by the following equation:

$$\text{Real exchange rate} = \frac{\text{nominal exchange rate X domestic price level}}{\text{foreign price level}}$$

Where all values are in the index form.

An increase in real exchange rate misalignment is expected to increase the risk of a currency crisis (Esquivel & Larrain, 1998).

3.2.11. Interest rates

This is defined as the average declared base lending rates of 10 leading banks in the country and as reported by Bank Negara.

High interest rates will lead to currency depreciation. This is because domestic real interest rate equals foreign interest rates; therefore high domestic nominal interest rates signal high domestic inflation rate, which in turn means that the exchange rate peg must collapse to maintain parity conditions (Roubini, 1998).

3.2.12. Capital inflow

Capital inflow is categorised into debt and foreign direct investments (loans vs. equity participation). Debt is further categorised into long term and short term debt. Further these debt (both long term and short term) can be categorised into private and official. Capital inflows is given by the following equation:

$$\text{Capital account}_{\text{balance of payment}} = \text{Capital inflow}_{\text{private}} + \text{Capital inflow}_{\text{government}} - \text{capital outflow}_{\text{private}}$$

3.2.13. Export growth

Export growth is given by the annual percentage change and is given by the following equation:

$$\text{Export growth} = \frac{\text{Export}_{\text{current year}} - \text{Export}_{\text{previous year}}}{\text{Export}_{\text{current year}}} \times 100$$

An increasing rate of export growth will add to the sustainability of the current account deficit by providing foreign exchange earnings to pay off the foreign debt. A decreasing rate of export growth signals will exacerbate the negative effects of a real exchange rate misalignment thereby adding to the probability of a currency crisis occurring (Corsetti, Pesenti & Roubini, 1998).

3.2.14. Foreign exchange reserves

There are 2 definitions of foreign exchange reserves:

1. stock of money reserves in terms of months of retained imports

2. ratio of liquid money (M2) to foreign reserves

A large and growing foreign exchange reserves will lead to a sustainable current account deficit. A sizeable foreign exchange reserves will also lend support to the exchange rate peg (Corsetti, Pesenti & Roubini, 1998).

3.3 Hypothesis

Previous research has established that macroeconomic indicators can be used as predictors of currency crises (e.g. Kaminsky, Lizondo & Reinhart, 1997 and Berg & Pattillo, 1998). Goldfajn & Valdes (1997) have shown that market expectations can play a role in exchange rate devaluations. The biggest indicator for forming expectations was exchange rate misalignment however there was no effective means to construct and measure an exchange rate misalignment indicator (Goldfajn & Valdes, 1997). Several other studies have tried to establish a correlation between investor expectations and exchange rate changes and macroeconomic fundamentals (Caramazza, 1993; Bartolini, 1993; Rose & Svenson, 1993). Roubini (1999) and Esquivel & Larrain (1998) have indicated that large and growing current account deficits may have contributed towards exchange rate misalignment in Asia. Further it has been shown that current account deficits that are not at equilibrium position will lead to real exchange rate depreciation (Clark, Bartolini, Bayoumi & Symansky, 1994).

This research project will attempt to carry on the development of the study on predicting currency crises by:

a) conducting an empirical investigation of the behaviour of the macroeconomic indicators identified by research to track the sustainability of the current account position of Malaysia prior to the crisis.

b) proposing a model to track investor expectations (on current account unsustainability) and vulnerability to triggering events (that would ultimately initiate a currency crisis).

In attempting to construct the hypothesis for this study, care was given to the ultimate objective of this thesis – to contribute towards the development of a signal system that managers can make use for business planning. Hence the focus is on possible trends that would indicate potential for expectations of exchange rate devaluation.

The hypothesis was thus constructed as follows:

It has been shown that a correlation exists between trends in macroeconomic factors and currency devaluation. It can be shown that a negative trend can be observed for at least 75% of the macroeconomic indicators for Malaysia during the 5-year period leading to the crisis in 1997.

3.4 Data gathering instrument

Basic macroeconomic data was obtained from standard government sources - the annual economic reports from the Ministry of Finance, Malaysia (the latest reports; 1998/1999 and 1999/2000 were used), Department of Statistics and Bank Negara (www.bnm.gov.my).

3.5 Analytical methods

The analytical treatment adopted in this thesis is descriptive analysis where raw macroeconomic data published by Bank Negara Malaysia was transformed into meaningful information by the tabulation method. The basic statistical analysis employed was cross tabulation (and various refinements of it like percentage cross tabulation).

The basic statistical calculations employed were the annual percentage change and ratios.

This annual percentage change is given in the general form as follows:

$$\% \text{ annual change} = \frac{\text{Value}_{\text{Year 2}} - \text{Value}_{\text{Year 1}}}{\text{Value}_{\text{Year 1}}} \times 100$$

Ratios were calculated as follows:

$$\text{Ratio} = \frac{\text{Value 1}}{\text{Value 2}}$$