CHAPTER 7

DISCUSSIONS OF FINDINGS AND CONCLUSION

7.1 Introduction

The main objective of this study is to examine the causal relations and dynamic interactions among stock prices, real economic activity (index of industrial production), real interest rate and real money balances from 1987 to 2001. The real money balances for M1 and real money balances for M2 are used in this study to investigate whether the results may be significantly different due to the definition of the money supply.

The analysis in this study is divided into two parts. The first part analyzes the full sample period, from January 1987 to December 2001, which consists of 180 monthly observations while the second part presents an analysis on two sub-periods. The data set is divided into two sub-periods corresponding to a significant change in the trend of the data series. The first sub-period covers January 1987 to August 1998 and the second sub-period covers September 1998 to December 2001. They correspond to the period before and after the implementation of selective capital controls in Malaysia.

The integration properties of the data were first analyzed. The cointegration technique was conducted to examine the existence of long-run relationships

among non-stationary variables. It was followed by the F-test in order to determine which variable adjusts to disequilibrium. Finally, the Granger causality methodology was used to investigate the lead-lag relationships among the variables. Impulse response function was for examining the responses of the variables due to one-time shocks.

7.2 Summary for the Full Sample Period

Based on the augmented Dickey-Fuller and Phillips-Perron unit root tests, the results provide evidence for the presence of a unit root in stock prices, industrial production and real money balances. The evidence of unit root is not so strong for the real interest rate. However, the unit root test with a structural break proposed by Perron (1989) suggests that all the series are I(1).

Two cointegrating relations exist among the variables. The optimal lag specification for the vector error correction model is one. The error correction specification enables the analysis of short-run dynamics together with the long-run steady state properties. The existence of long-run relationships among the variables implies that each variable will adjust respectively to return to equilibrium path in respond to any deviations from the long-run relationships. The results of the F-test indicate that real interest rate and real money balances adjust to disequilibrium for the first and second systems where M1 and M2 are used as

the monetary aggregate respectively. The industrial production adjusts to disequilibrium when real money balances in broader definition (M2) are used.

The results of the Granger causality test suggest that when M2 is used, stock prices, real interest rate and real money balances tend to lead industrial production apart from its own past value. This finding shows evidence that stock market acts as a leading indicator for future real economic activity. Stock prices also tend to lead real interest rate. There is a two-way causality between real interest rate and real money balances. This is expected since there is a close relationship between the two variables in the monetary policy decision making. No variable seems to lead stock prices. This may be due to speculative bubbles that occurred during market crash and boom in the entire sample period.

7.3 Summary for the Two Sub-Periods

Based on the results of the cointegration test, stock prices, industrial production, real interest rate and real money balances are cointegrated in both sub-periods. For the first sub-period, there are three cointegrating relations in both the systems for M1 and M2. The number of cointegrating relations is less for the second sub-period. The results suggest two cointegrating relations for the first system and a unique cointegrating relation for the second system.

The results of the F-test indicate that during the first sub-period, industrial production, real interest rate and real money balances for M1 respond to disequilibrium. As for real money balances for M2 in the second system, all variables tend to adjust to disequilibrium. For the second sub-period, the results show that industrial production, stock prices and real interest rate respond to disequilibrium for the money supply in narrow definition (M1). However, industrial production no longer responds to disequilibrium in the second system with M2.

From the results of the Granger causality test in the first sub-period, stock prices, real interest rate and real money balances Granger-cause industrial production. In other words, all the variables mentioned above tend to lead real activity. Meanwhile, there is no evidence for such a relation during the second sub-period. In the first sub-period, industrial production and real money balances tend to lead stock prices. Real money balances as leading indicators of stock market may reflect the importance of money supply M2 on the credit availability. All variables tend to lead stock prices and real interest rate in the second sub-period. There is no other variable that significantly Granger-causes real money balances in both sub-periods. Real money balances tend to be independent. Real interest rate is Granger-caused by real money balances and its own previous value in the first sub-period. After the implementation of selective capital controls and some monetary measures, industrial production, stock prices and real money balances tend to influence future real interest rate.

In this study, one to ten months ahead forecast are used in the analysis of the impulse response function. Based on the results, the responses of the variables take a longer period to taper off for the second sub-period compared to the first sub-period. Also, the magnitude of response is larger in the second sub-period.

7.4 Discussions of Findings

The presence of cointegration among stock prices and macroeconomic variables reported in this study implies that efficient market hypothesis does not hold for the Malaysian stock market. In other words, the Kuala Lumpur Composite Index is not informationally efficient with respect to industrial production, real interest rate and real money balances. The investors may able to predict future stock prices and gain abnormal profit by exploiting the long-run relation with these variables. This is true for both sub-period of analysis.

In addition, stock prices were found to lead industrial production in the first sub-period but not the second sub-period. This shows that stock market is only a leading indicator for future real economic activity only when the stock market is performing well generally.

Real money balances do not respond to disequilibrium since the adoption of selective capital controls regime. The active role in monetary policy seems to have been replaced by interest rate. This is an interesting observation that we can explain by using the IS-LM framework. Since September 1998, the Malaysian Ringgit (RM) was made internationally inconvertible and fixed to the US dollar at a rate of US$1=RM3.80. Under the form of fixed exchange rate regime, money supply is not an exogenous variable. Domestic money supply may change either as a result of a change in the volume of bank lending or as a result of a change in the foreign currency reserves or both. Since the monetary authority cannot directly control the change in the reserves, neither can the change in the domestic money stock be controlled. As a result, under a fixed exchange rate regime, the money supply cannot be regarded as a policy variable. Consider the following relation:

$$M^s \equiv RS + DC \tag{7.1}$$

where

M^s is the money supply,

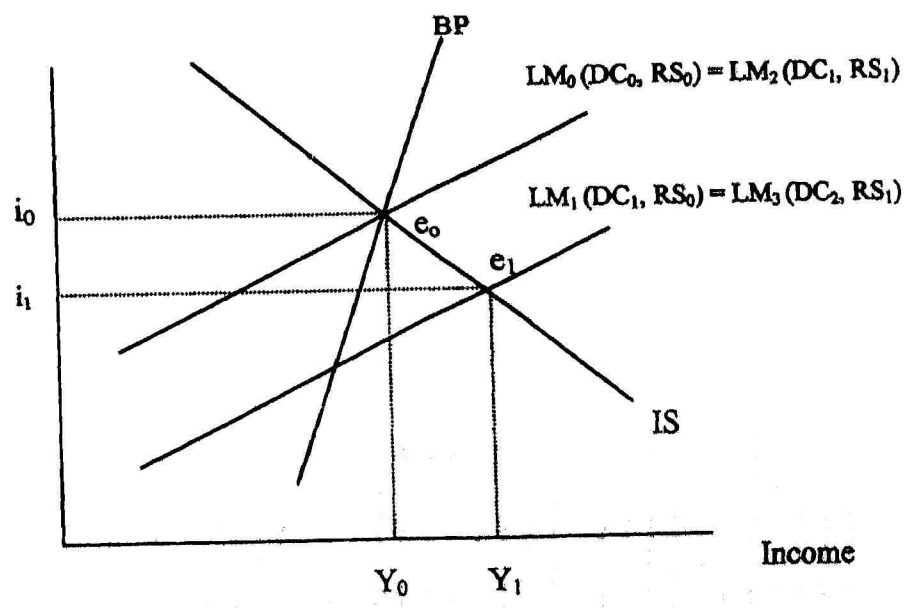
RS is the foreign reserves,

DC is the domestic credit.

Equation (7.1) implies that the money supply is identically equal to the sum of the domestic credit generated by the banking system plus the value of the country's reserves of gold and foreign currency held at the central bank.

For the case of Malaysia, interest rate becomes an active monetary tool rather than money supply. BNM directly make use of the intervention rate and thus influence the domestic lending rate of the commercial banks and finance companies. We look into the effectiveness of monetary policy (change in M^s) with a fixed exchange rate through the IS-LM analysis.

Figure 7.1: Expansionary Monetary Policy under Fixed Exchange Rate



The BP schedule refers to a set of real income-nominal interest rate combination that maintains a zero balance for balance of payments. The BP schedule is relatively steep due to low capital mobility. The money supply consists of foreign

reserves and domestic credit. A monetary expansion or more precisely, of an expansion of domestic credit from DC_0 to DC_1 will increase total money supply. The LM curve will move downward from LM_0 to LM_1 in Figure 7.1. The initial equilibrium point is at e_0. The new equilibrium point at e_1 is the result of an increase in the component of the money supply with an unchanged quantity of foreign reserves. Expansionary monetary policy causes a rise in real income. This includes an increase in imports and a consequent trade deficit. Although the fall of interest rate (from i_0 to i_1) may worsen the capital account balance but the effect is relatively insignificant due to the control of capital movements. The overall balance of payments deficit and the excess supply of RM mean that the fixed exchange rate can only be preserved by running the reserves down. The outcome is a gradual reduction in the foreign currency of the monetary base. If the central bank does not sterilize the outflows of foreign exchange reserves, the assets will decline. To keep the exchange rate fixed, the central bank will sell the exchange reserves and the money stock starts to decrease until the money stock returns back to the original quantity of money before the monetary expansion (LM_2). The only difference is in the composition of the money stock, which is a lower fraction of foreign currency (RS_1 instead of RS_0) and greater fraction of domestic credit (DC_1 instead of DC_0). In the new equilibrium condition, interest rate, real income and balance of payment returned to the initial level.

Suppose the central bank conducts a policy of sterilization in order to prevent a change in the foreign exchange reserves from affecting the money stock by further expanding domestic credit (DC_1 to DC_2). The Central bank has to add sufficient domestic assets, such as government bonds, to prevent the total assets from falling. This policy will induce the equilibrium point at e_1, with higher real income and lower interest rate.

Nevertheless, the policy of continuous sterilization has drawn a great deal of debate. Each expansion of domestic credit will prolong the reserve loss and hence generate the need for further credit creation. The domestic credit component of the money stock will become larger and the reserves component become smaller. Furthermore, there will come a stage where the foreign reserves is reduced to a critical level before being exhausted. As a result, the usefulness of sterilization is likely to be limited.

An additional observation that supports this evidence is that since September 1998, the real money balances is no longer Granger-caused by its own lag values. This means that it is not possible to pursue monetary targetting any longer.

Real interest rate was not Granger-caused by industrial production in the first sub-period, but the causal relation from industrial production to real interest rate is very strong after September 1998. This reveals that interest rate has become an active monetary tool in the second sub-period for controlling the economic activity. Also, the real interest rate is explained by the level of economic activity

in the second sub-period but this relation is not found in the first sub-period. The targetting of interest rate depends also on the level of industrial production.

On the contrary, the real money balances Granger-caused industrial production in the first but not second sub-period. This suggests monetary targetting was used to affect economic activity before the fixed exchange rate regime.

7.5 Limitations of the Study and Suggestions for Further Research

The error correction specification, which is the VEC model, allows for short-run dynamics and long-run relationship analyses. However, the cointegration test to determine the VEC model does not consider any significant structural changes in the data series. In fact, the economy may experience some structural changes due to the different development phases. Innovations in the model that take the existence of structural breaks into consideration are encouraged.

In this study, we follow Perron's (1989) unit root test with a structural break procedure, which considered the break fraction as exogenous and pre-determined. Future work may make use of Zivot and Andrews' (1992) procedure that the fraction was regarded as an unknown parameter.

The relationships among various macroeconomic variables and stock prices are dynamics. The inclusion or exclusion of certain variables may yield different results. The differences in results may also due to different time period and the definition of the variables used. The analysis for different time period and inclusion of other macroeconomic variables are highly recommended for further research. Examples are to use different proxies for the stock market index, interest rate, economic activity and monetary aggregates.