CHAPTER 4

SPECIFICATION AND ESTIMATION OF THE MODEL

Introduction

The first section of this chapter will discuss about the summary statistics used in the selected equations. The following section will deal with the private expenditure sector that consists of private consumption and investment. The third section highlights the external trade. The fourth section sheds light on the government sector, in which estimations are made for government consumption, investment and direct tax. The government budget constraint is treated as identity. The fifth section will highlights the monetary sector. Equations for currency deposit ratio, excess reserve ratio and price level are estimated, and the last section is about the aggregate demand and other identities.

4.1 Summary Statistics Used In The Selected Equations

The estimated equations presented in the following section have been chosen from several alternative hypotheses and specifications. The selection of the prepared equations has been based on both theoretical and statistical criteria. In this section, we will elaborate briefly some of the common statistical criteria used in the choice of the single equations.

The test of the statistical significance of the explanatory variable is the t-ratio, derived from simple division of the estimated coefficient by its standard error. If the t-ratio exceeds the critical t-value, then the explanatory variable in question is said to be "statistically significant" in the determination of the dependent variable. In the estimated equations, the t-ratio are presented in parentheses beneath the corresponding coefficient estimates. In general, the "accepted" variables in the chosen equations have been found to be statistically significant at the 1 percent, 5 percent or 10 percent levels. Only in certain cases are the explanatory variables significant at 15 percent to 25 percent.

A standard measure of the "goodness of fit" of a regression is R^2 coefficient of multiple determination. This coefficient measures the proportion of the total variation in Y (that is the dependent variable) which can be attributed to the *influence of the explanatory variables. A high value of* R^2 *is usually associated* with a good fit of the regression line. However, a high R^2 in time series regression need not indicate any causal link between the dependent and explanatory variables but may simply reflect the trends in the variables. When extra variables are added to the regression, R^2 invariably increases, regardless of the relevance of these additional variables. For this reason, the alternative measure, the adjusted R^2, written $\bar{R}^2$, is used since $\bar{R}^2$ may fall when extra variables are added.

The standard error of the regression, S.E.R., measures the dispersion of the error term associated with the regression line. S.E.R. is the square root of the residual variance (see for example, Thomas, 1985).

$$\text{S.E.R.} = \sqrt{\frac{\Sigma e_t^2}{N-k}}$$

where e is the residual; N is the number of observations and k is the number of parameters being estimated. A lower value of S.E.R. is indicative of a better fit than a higher value.

A problem often encountered in time series regressions is that of autocorrelation (AR). AR exists if the value of the disturbance term in any particular period is correlated with its own preceding value. This was due to, for example the omission of explanatory variables, misspecification of the mathematical form of the model; misspecification of the true random term; interpolation of the data series; or as a result of transformations (such as the

Koyck scheme) applied to an equation. For small samples, the most common test for autocorrelation is the Durbin-Watson (DW) statistics (Gujarati, D. N., 1988, p.375), which is defined as:

$$DW = \frac{\sum_{t=2}^{N} (e_t - e_{t-1})^2}{\sum_{t=1}^{N} e_t^2}$$

In absence of autocorrelation, DW is expected to take a value of approximately equal 2. The DW statistics is designed for use with regression equations in which all the explanatory variables are exogenous. If there is lagged dependent variable in the equation, DW statistics is biased towards 2 and may therefore indicate serial independence when autocorrelation may in fact be present. The alternative test in this case is the Durbin h statistics (Gujarati, D.N.,1988, pp.526-527).

$$h = \rho \sqrt{N/1-N\,[Var\,(a_1)]}$$

where ρ is the estimated autocorrelation coefficient, and var(a_1) is the estimated variance of the estimate of (a_1) which is the coefficient on the lagged dependent variable, ρ may be approximated by (1–½ DW), where DW is the estimated Durbin-Watson statistic. The acceptance region for the null hypothesis of no autocorrelation is between –1.96 and 1.96 (Gujarati, D.N.,1988, p.527).

4.2 Real Private Consumption

There are numerous theories[1] about consumption expenditure including Keynes absolute income theory, Duesenberry's relative income theory, Friedman's permanent income theory, Ando and Modigliani's life-cycle hypothesis and other various complicated forms as applied to practical quantitative model.

In estimating consumption function, it is conventional to distinguish between durables and non-durables. However, due to data limitation, such separation is not undertaken in this study. Hence total private consumption expenditure was estimated by a single behavioral equation[2].

In our model, we postulated the consumption function based on the Friedman permanent income hypothesis. According to this hypothesis, consumption function is a functional to permanent income but with a constant added in the function as follows:

$$C_t = \beta_0 + \beta_1 + Y_t^p \text{...}(4.2.1)$$

Approximating Y_t^p by taking a geometrically declining weighted average of present and past, yields

$$C_t = \beta_0 + \beta_1 + Y_t^p + \beta_1\lambda\ Y_{t-1}^p + \beta_1\lambda^2\ Y_{t-2}^p + \mu_t \text{......................}(4.2.2)$$

Where $0 < \lambda < 1$

Applying Koyck transformation (see Koyck, 1954 and Gujarati, 1988, pp. 513-515), lagging equation (4.4.2) by one period to obtain

$$C_{t-1} = \beta_0 + \beta_1 + Y_{t-1} + \beta_1\lambda\ Y_{t-2} + \beta_1\lambda^2\ Y_{t-3} + \text{......................}(4.2.3)$$

Equation (4.2.3) is then multiply by λ to give

$$\lambda C_{t-1} = \lambda\beta_0 + \beta_1\lambda\ Y_{t-1} + \beta_1\lambda^2\ Y_{t-2} + \beta_1\lambda^3\ Y_{t-3} + \text{.................}(4.2.4)$$

Substrating (4.2.4) form (4.2.2), yields

$$C_t - \lambda C_{t-1} = (1-\lambda)\beta_0 + \beta_1 Y_t$$

or rearranging,

$$C_t = (1-\lambda)\beta_0 + \beta_1 Y_t + \lambda C_{t-1}$$

$$= \beta_0' + \beta_1 Y_t + \lambda C_{t-1} \quad \text{...(4.2.5)}$$

From equation (4.2.5) the dependent variable C_t is a function of the income and of itself lagged one period. According to Smyth and McMahon (1972), the inclusion of the lagged dependent term (C_{t-1}) may be regarded as representing consumers' habit persistence-inertia or sluggishness in the adjustment of consumption to income. This is so as consumption is originally postulated to be a function of present and past incomes, i.e. prior to the Koyck's transformation above. Apart from disposable income as the most important explanatory variable, considerable emphasis has been placed upon liquid assets as a determinant of consumption in many studies on consumption function (e.g. by Zellner, Huang and Chau (1965), Zellner (1957)). The liquid assets variable may serve as a proxy for total wealth[3].

In Less Developed Countries (LDC's), the liquid assets term rarely encountered in consumption functions, presumably because of the relatively underdeveloped nature of financial markets. In the Indian model, Marwah (1972) found the expected positive coefficient on the liquid assets variable, which was real money supply. In the Korean models, Shin and Kim (1981) and Cheong (1983) also found that the money supply and changes in real money supply for the latter study, exert positive impact on the consumption function. As such, in our study, different measures of liquid assets were attempted, but the most successful was net liquid assets (see Table 4.1) which include total currency, demand deposits, savings and other fixed deposits, less total loans and advances (or credit) to the private sector[4]. This term turned out with the expected positive sign in the consumption function.

The justification for the incorporation of liquid assets, that is, to explain the effects of inflation. The influence of the inflation is incorporated in the real liquid assets term through the use of consumer price index as a deflator. The hypothesis is that inflation erodes the real value of wealth or assets that denominated in money terms. When this happens, individuals reduce their consumption in an effort to maintain wealth. Another important purpose is that, this variable serves as one of the channel that link between the monetary and real sectors.

Another variable considered in this study is the rate of interest to examine whether households' consumption or savings decision are sensitive to changes in the interest rate. According to Hamburger (1967), the rate of interest is the most appropriate monetary variable in the consumption function since it serves as a proxy for the cost of credit as well as a measure of the yields on alternative assets. A negative coefficient on the rate of interest implies a stronger negative substitution effect as a higher rate induces people to save more or consume less. In our study, rate of savings deposit was significant and has a negative sign in consumption function (see Table 4.1). From the above discussion, we specified the consumption function as follows:

$$RCP_t = f\left[Yd_t, \left(\frac{M2}{P}\right)_t \text{ or } \left(\frac{NLA}{P}\right)_t, r_t, RCP_{t-1}\right] \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(4.2.6)$$

Where,

RCP_t = real private consumption

Yd_t = real disposable income

$M2_t$ = nominal money supply

NLA_t = net liquid assets (obtained by M2 less loans and advances)

P_t = consumer price index (1985=1.00) as a deflator[5].

r_t = rates of savings deposit

The estimated results of equation (4.2.6) are reported in Table 4.1 The real money supply $\left(\frac{M2}{P}\right)_t$ be it current or lagged and with or without the inclusion of rate of interest term (RSD_t) consistently displays unexpected sign and moreover insignificant[6] (equations 1, 2, 3, 4, 5 6, 10, 11 and 12). This results are somewhat different that obtained by Tan (1987) in his quarterly model which, the real money supply variable is not only shows the right sign but also significant at 10 percent level. It should be noted that, the difference may be due to the using of quarterly data as well as the different sample period by Tan (1987). However, the inclusion of real net liquid assets $\left(\frac{NLA}{P}\right)_{t-2}$ lagged 2 period together with the interest rate variable has the right sign and highly significant (equation 15) indicating the importance of these variables in private consumption function. From the equation 15, we can inferred that about 2.4 percent of the real consumption movement is explained by the liquid assets term[7].

The statistically significant sign and negative coefficient on the rate of interest suggests a strong substitution effect whereby increases in the rate of interest have led to an increase in savings or decline in consumption. The lagged dependent term RCP_{t-1} shows the expected sign and highly significant. This implies that the habit persistence or inertia existing the consumption function. The short run marginal propensity to consume (MPC) of 0.56 is higher to that obtained by Cheong (1977) and Semudram (1982) which recorded MPCs of 0.35 and 0.21 respectively. The estimated long run MPC is about 0.88 which is very close to that obtained by Cheong (1977). On the whole, the equation 15 capable of explaining about 99.56 percent of variation in the real consumption function. The h-value also indicates the non-existence of serial correlation. Henceforth, equation 15 is selected for incorporation into the model.

TABLE 4.1

REAL PRIVATE CONSUMPTION (RCP_t)
(in natural log terms)

	1	2	3	4	5	6	7	8
C	−0.88640 (−1.1612)	−0.8326 (−0.7005)	−0.8891 (−0.7670)	−0.8867 (−1.1099)	−0.8888 (−0.6211)	−0.8757 (−0.6773)	−0.6443 (−0.5742)	0.0951 (0.1145)
Yd_t	0.7867 (7.5523)	0.7083 (7.9985)	0.7047 (8.8189)	0.7846 (7.2557)	0.7017 (7.6776)	0.7042 (7.6776)	0.7045 (9.0743)	0.6888 (8.7727)
$\left(\frac{M2}{P}\right)_t$	−0.1215 (−1.1718)			−0.1179 (−1.0872)				
$\left(\frac{M2}{P}\right)_{t-1}$		−0.0186 (−0.1287)			0.0037 (0.0255			
$\left(\frac{M2}{P}\right)_{t-2}$			−0.0043 (−0.3369)			−0.0042 (−0.3224)		
$\left(\frac{NLA}{P}\right)_t$							−0.0081 (−0.966)	
$\left(\frac{NLA}{P}\right)_{t-1}$								0.0022 (0.2452)
$\left(\frac{NLA}{P}\right)_{t-2}$								
RSD_t				0.0029 (0.0792)	0.0185 (0.1413)	0.0185 (0.4520)		
RCP_{t-1}	0.3789 (4.5258)	0.3519 (3.1931)	0.3461 (4.1897)	0.3771 (4.3540)	0.3381 (3.0678)	0.3425 (3.8789)	0.3258 (3.9900)	0.2638 (3.3753)
$\bar{R}^2$	0.9965	0.9963	0.9963	0.9964	0.9962	0.9963	0.9965	0.9962
S.E.R.	0.0301	0.0310	0.0309	0.0307	0.0315	0.0315	0.0304	0.0316
h	−0.6237	−0.4204	−0.4324	−0.6169	−0.3022	−0.3091	−0.3606	−0.3866

TABLE 4.1

REAL PRIVATE CONSUMPTION (RCP_t)
(in natural log terms)
(continued)

	9	10	11	12	13	14	15
C	0.4131 (2.1029)	−0.8763 (−1.2013)	−0.6728 (−0.8373)	−0.9328 (−0.7436)	−0.6741 (−0.5416)	−0.9665 (−0.7.04)	0.2751 (1.8061)
Yd_t	0.4945 (5.4625)	0.7881 (7.3048)	0.7194 (7.2372)	0.7066 (8.5292)	0.7055 (8.7214)	0.6965 (8.1864)	0.5649 (7.8670)
$\left(\frac{M2}{P}\right)_t$		−0.1254 (−1.2216)					
$\left(\frac{M2}{P}\right)_{t-1}$			−0.1247 (−1.2145)				
$\left(\frac{M2}{P}\right)_{t-2}$				−0.0041 (−0.3137)			
$\left(\frac{NLA}{P}\right)_t$					−0.0080 (−0.9433)		
$\left(\frac{NLA}{P}\right)_{t-1}$						0.0043 (0.4993)	
$\left(\frac{NLA}{P}\right)_{t-2}$							0.0242 (2.0481)
RSD_t		−0.0086 (−0.2204)	−0.0574 (−1.5671)	0.0089 (0.2107)	0.0099 (0.2370)	0.0103 (0.2429)	−0.1091 (−4.1475)
RCP_{t-1}	0.4358 (4.0848)	0.3819 (4.3424)	0.4391 (3.1816)	0.3465 (3.9842)	0.3258 (3.7413)	0.3526 (3.8919)	0.3739 (4.4706)
$\bar{R}^2$	0.9926	0.9964	0.9962	0.9962	0.9963	0.9963	0.9956
S.E.R.	0.0441	0.0307	0.0319	0.0316	0.0311	0.0314	0.0340
h	0.6887	−0.6984	0.3363	−0.3867	−0.2834	−0.4704	0.9946

4.3 Real Private Investment

There are numerous theories concerning the investment behavior. The accelerator principle which was propounded by Clark (1979) is one of the most celebrated hypotheses on decision to invest. This model is based on a fixed capital output ratio :

$$K_t^* = \alpha Y_t \qquad \text{...(4.3.1)}$$

where K_t^* is desired capital stock and Y_t is output. Actual capital stock is assumed to be optimally adjusted in each period so that $K_t^* - K_{t-1}^*$, net investment I_t^N, is then given as,

$$I_t^N = K_t - K_{t-1} = \alpha (Y_t - Y_{t-1}) \qquad \text{.......................................(4.3.2)}$$

The major weaknesses of this rigid accelerator model is the assumption of instantaneous adjustment of K_t to K_{t-1} since it implies an infinitely elastic supply of capital goods and that the firm rigidly maintain a constant capital-output ratio. To overcome this, Chenery (1952) and Koyck (1954), proposed the flexible accelerator model (FAM), which introduced the partial adjustment process between desired and actual capital stock, which is

$$K_t - K_{t-1} = \lambda\, K_t^* - K_{t-1} \qquad \text{...(4.3.3)}$$

where λ is a coefficient greater than zero but less than one.

Which implies that net investment, $I_t^N$is only some proportion, λ, of the gap between desired and actual capital stock. Desired capital stock, K_t^* is still assumed to bear a fixed relationship to output. Substituting equation (4.3.1) into (4.3.3), yields

$$K_t - K_{t-1} = \alpha\lambda Y_t - \lambda K_{t-1} \qquad \text{...(4.3.4)}$$

which may be written as

$$K_t = \alpha\lambda Y_t + (1-\lambda)K_{t-1} \qquad \text{...(4.3.5)}$$

if we assumed that depreciation D_t is a proportion of existing capital stock, then we have;

$$D_t = \delta K_{t-1} \qquad \text{...(4.3.6)}$$

where δ is the rate of depreciation. Gross investment, I_t^G is thus derived as the sum of net investment ($I_t^N = K_t - K_{t-1}$) and replacement investment ($D_t = \delta K_{t-1}$)

$$I_t^G = K_t - K_{t-1} + \delta K_{t-1} \qquad \text{...(4.3.7)}$$

Substituting (4.3.4) into (4.3.7) now yields

$$I_t^G = \alpha\lambda Y_t + (\delta-\lambda)\, K_{t-1} \qquad \text{...(4.3.8)}$$

which states that investment is a function of current output and lagged capital stock. Equation (4.3.8) is however overidentified since it contains three structural parameters, α, λ and δ which are to be determined in terms of two coefficients ($\alpha\lambda$) and ($\delta-\lambda$). Furthermore, the estimation of equation (4.3.8) requires capital stock series (K_t) which is unavailable. Alternatively, the Koyck transformation may be applied to equation (4.3.8) which produces an estimating equation with exactly identified parameters:

$$I_t^G = \alpha\lambda Y_t - (1-\lambda)\, \alpha\lambda Y_{t-1} + (1-\lambda)I_t^G \qquad \text{......................(4.3.9)}$$

which eliminates the capital stock term as well.

Apart from the above, we now add a number of other variables to the investment function to capture the various features of the Malaysian economy. The real investment function is said to postulate to three main factors:

1) the availability of bank credit to private sector (the real money stock, M2 is used as a proxy)

2) the level of the private capital inflow

3) the level of public investment.

The argument for (1) can be made on several grounds. In developing countries, such as Malaysia, the capital market is still underdeveloped and at the same time, it is highly regulated. Numerous requirements are imposed on a company which plans to raise its equity capital through the stock market. In addition, there also exists certain amounts of credit rationing in the form of lending guidelines on the extension of credit by the commercial banks and finance companies. As a result, the bulk of the domestically financed investment expenditure originates not from the capital market (Ho, 1983, p.126). Hence it is argued that for developing countries, liquidity constraint instead of interest rate or cost of borrowing is more relevant consideration in explaining investment behavior[8].

Furthermore, it is also our efforts to establish a feedback from the monetary sector to the real sector. Since the control of total bank credit usually is the principal instrument of monetary policy in developing countries, through varying the composition of credit between the public and private sector, the government can affect the speed and ability of private investors responses to achieve their desired levels of investment. Monetary policy can thus have a direct and potent force on the rate of private investment (Esa, Halipah, 1990, p.34). Hence, this variable can serve as an important ingredient for the transmission mechanism of monetary and credit policy on investment.

The inflow of foreign capital may served as a source of external funds for investment. In the 1960's, it was generally had (see Chenery and Strout, 1966) that external capital could speed up resource mobilization and structural transformation needed for the acceleration of capital formation in less developed countries (LDC's). Study by Wai and Wong (1982) found that private capital inflow was the most significant variable in determining investment in Mexico. An increasingly significant component in the inflow of foreign capital in private sector-oriented developing economies is foreign direct investment. It is undoubtedly that this variable would have a positive impact on private investment, although the precise relationship will have to be determined empirically. Numerous arguments are given to uphold the foreign direct investment[9] as an explanatory variable in the investment function can be found in Esa (1990) study[10].

In LDC's, government investment being identified as a factor affecting the private investment in these countries can be found in Wai and Wong (1982); Blejer and Khan (1984); Khan, A. H. (1988) and Greene and Villanueva (1991). However at the theoretical level the effect of public sector investment is rather ambiguous. On the one hand, public investment involves useful infrastructure-transportation system, schools, water and sewerage systems and the like. Projects in these areas tend to increase private investment - "crowding in effect." On the other hand, public sector may detract from private investment activity to the extent that it substitutes for or crowd out private investment. This may occur when the high fiscal deficits push up interest rates or reduce the availability of credit to the private sector, or both, thus crowding out private out private investment (Serven and Solimano, 1992, p.100 ; Easterly and Schmidt-Hebbel, 1993, p.228). In Wai and Wong (1982) study, they found that government investment to be the most significant in the investment functions estimated for Greece, Korea and Malaysia. A study by Blejer and Khan (1984) based on cross-country data found that government investment in infrastructure is complementary with private investment (and other types of government investment are not). Greene and Villaneuva (1991) also arrived at similar conclusion based on multicountry panel data.

Based on the above discussion we specified investment function as follows:

$$RIN_t = f(\Delta RGDP_t, \left(\frac{M2}{P}\right)_t, \left(\frac{KP}{P}\right)_t, RIG_t, RIN_{t-1}) \quad ....(4.3.10)$$

where RIN_t = real private investment

$\Delta RGDP_t$ = $RGDP_t - RGDP_{t-1}$ (change in real gross domestic product)

$M2_t$ = nominal money stock

P_t = consumer price index (1985=1.00)

$\left(\frac{KP}{P}\right)_t$ = real private capital inflows

RIG_t = real government investment expenditure

The estimated results of equation (4.3.10) are presented in Table 4.2. Of all the equations estimated, equation (10) is preferred for the following reasons. Changes in the real output has the right sign and the coefficient is significant. This conforms with the accelerator model of the investment function. The availability of domestic credit as represented by real money stock $\left(\frac{M2}{P}\right)_t$, has the right sign and the coefficient is highly significant. Similar results also have been

TABLE 4.2

REAL PRIVATE INVESTMENT (RIN_t)

	1	2	3	4	5	6
C	−568.97 (−0.7617)	−535.87 (−0.7409)	−480.81 (−0.6978)	27.209 (0.1101)	21.846 (0.0869)	6.3522 (0.0246)
$\Delta RGDP_t$	0.1779 (3.2651)	0.1872 (3.6133)	0.1991 (4.0054)	0.2033 (5.4207)	0.2121 (5.6649)	0.2182 (5.7351)
$\left(\frac{M2}{P}\right)_t$	0.0651 (0.7699)			0.0553 (3.2288)		
$\left(\frac{M2}{P}\right)_{t-1}$		0.0608 (0.7449)			0.0554 (3.0450)	
$\left(\frac{M2}{P}\right)_{t-2}$			0.0468 (0.7231)			0.0522 (2.7554)
$\left(\frac{KP}{P}\right)_t$				0.7896 (5.7990)	0.7921 (5.7029)	0.7921 (5.5381)
RIG_t						
RIG_{t-1}						
RIN_{t-1}	0.8671 (2.9802)	0.8964 (3.3786)	0.9491 (4.6219)	0.6168 (7.0721)	0.6319 (7.2466)	0.6589 (7.6476)
$\bar{R}^2$	0.9776	0.9772	0.9766	0.9881	0.9876	0.9870
S.E.R.	981.12	991.21	1004.74	717.67	729.64	748.21
h	1.8769	1.9199	1.8834	0.7076	0.6932	0.7826

TABLE 4.2

REAL PRIVATE INVESTMENT (RIN_t)
(continued)

	7	8	9	10	11	12
C	−30.111 (−0.1176)	−38.91 (−0.1498)	−57.698 (−0.2174)	−10.142 (−0.2857)	−21.451 (−0.0619)	−2.928 (−0.1168)
$\Delta RGDP_t$	0.2092 (5.47441)	0.2179 (5.7347)	0.2241 (5.8204)	0.1912 (4.9962)	0.1996 (5.2392)	0.2063 (5.31756)
$\left(\frac{M2}{P}\right)_t$				0.0604 (3.4724)		
$\left(\frac{M2}{P}\right)_{t-1}$		0.0531 (2.8816)			0.0617 (3.3251)	
$\left(\frac{M2}{P}\right)_{t-2}$			0.0499 (2.6135)			0.0587 (3.0210)
$\left(\frac{KP}{P}\right)_t$	0.7062 (4.2736)	0.7027 (4.1876)	0.6965 (4.048)	0.6445 (3.6499)	0.6399 (3.5738)	0.6439 (3.49561)
RIG_t	−0.146 (−0.8997)	−0.1568 (−0.9544)	−0.1678 (−0.9998)			
RIG_{t-1}				−0.1639 (−1.992)	−0.1739 (−1.3185)	−0.1707 (−1.2547)
RIN_{t-1}	0.7563 (4.2481)	0.7803 (4.3757)	0.8162 (4.5521	0.7519 (5.4929)	0.7729 (5.6330)	0.7978 (5.7133)
$\bar{R}^2$	0.9879	0.9876	0.9870	0.9883	0.9880	0.9873
S.E.R.	720.42	730.94	748.21	709.05	719.10	739.76
h	1.9073	1.7455	2.2649	0.0025	−0.0954	0.0082

obtained by Tan (1987) and Semudram, M et al (1990). The foreign direct investment variable[11] as represented by real private capital inflows also shows the satisfactory result. This reveals that the increasingly important role that this form of investment played in the development of the economy in recent years. Similar findings also obtained by Semudram, M. et al (1990). The government investment with a one-year lag (RIG_{t-1}) Is significant at 20 per cent level and has a negative sign instead of current government investment variable. This indicates the crowding out effect outgrowth the crowding in effect[12]. This may be so if the public investment exerts a negative influence on private investment because the public sector diverts the private sector's real financial resources for its own use. Thus in this case, public investment can substitute for private investment[13]. Hence in order to meet our model operational needs, equation (10) is picked for incorporation into our model by virtue of having the highest $\bar{R}^2$ and the lowest standard error of regression amongst all the equations in the table.

4.4 External Trade

It has been generally assumed that in the development literature (Chenery and Strout, 1966; Maizels, 1968) demand for imports and exports is price inelastic This assumption should not surprisingly valid for Malaysia as substantial portion of her imports made up of investment and intermediate goods that are necessary for the process of industrialization. As such it can be argued that price inelasticity has used to be the feature of Malaysian import demand. Such inference is based upon a cursory view at the development of the structure of Malaysia export demand. Ever since the pre-Independence days till the late 1960's, the imports were largely comprise of consumption goods since the domestic consumption good's industry was yet to developed to the extent able to cater domestic needs. Hence, much efforts were gear up to promote the import-substitution industries at those days. However, at the beginning of 1970's, import-substitution industrialization was already felt to have reached a saturated point and thus emphasis is re-oriented toward export-led oriented industrialization. As this industry in progress, increasingly sophisticated investment and intermediate items are needed on basis of both efficiency and foreign marketability of products. Since Malaysia technology is relatively backward, reliance on foreign supplies for these items is inevitable. All these may speak for the low price elasticity of import demand of Malaysia.

Empirical studies by Houthakker and Magee (1969), Taplin (1973) and especially for Malaysia by Alias (1978) to name a few, assume infinite price elasticity for the world supply of imports in their estimation of import demand relationship. In these studies, except Alias (1978), they also estimated export demand functions based upon the assumption of infinite price elasticity of an individual country's supply of exports. Both the assumptions of infinite foreign price elasticity of Malaysian exports are reasonable a priori. The assumption is appropriate in estimating the import demand relationship as the Malaysian share of total world imports is relatively negligible. The assumption is also justifiable for estimating the export demand function since primary commodities form a significant proportion of Malaysia's total exports.

4.4.1 Import Demand Function

It has been suggested by Thirlwall (1982) that there is no correct a priori specification of import demand function. Investigations must "therefore proceed on a trial-and-error basis according to the data availability, their reliability and the purpose of the study" (Thirlwall, 1980, p.195). In our study the demand for real imports is specified as a function of relative price of imports, real gross domestic product and real net foreign assets of the central bank as follows:

$$RMM_t^d = a_0 + a_1 \, RGDP_t + a_2\left(\frac{PM}{P}\right)_t + a_3\left(\frac{NFA}{PM}\right)_t \qquad ....(4.4a)$$

where

RMM_t^d = aggregate real imports desired computed by deflating nominal imports of goods by the unit value of imports

RGDP = gross domestic product in 1985 constant prices.

PM = unit value of imports (1985=1.00) as a proxy for import price index

P = consumer price index (1985=1.00)

NFA = net foreign assets of the central bank

It is assumed that, as a small and open-economy, that is relevant for Malaysia, the import supply curve facing Malaysia is deemed horizontal and hence import prices are treated exogenous. Unless the assumption is valid, mere estimation of the import demand function may yield biased and inconsistent parametric estimates (Goldstein and Khan, 1978).

Equation (4.4a) implies that importers are always on their demand function. It is also assumed that imports take time to adjust to their desired or optimal level (see Turnvosky, 1968; Houthakker and Magee, 1969; Semudram, 1981). Moreover, it should be noted that imports are frequently bound by contracts extending over a period of time, which means that they cannot respond instantaneously to changes in demand. For these reasons, we incorporate the partial adjustment mechanism in which a change in imports is some fraction (γ) of the difference between desired demand for imports in t period and actual imports in period t–1 as follows:

$$\Delta RMM_t = \gamma\left(RMM_t - RMM_{t-1}\right) \qquad \text{..........................(4.4b)}$$

where $0 \leq \gamma \leq 1$

Hence,

$$RMM_t^d = \frac{1}{\gamma} RMM_t + \left(1 - \frac{1}{\gamma}\right) RMM_{t-1} \qquad \text{..........................(4.4c)}$$

By substituting (4.4c) in (4.4a), we obtain the following after natural-log transformation :

$$\log RMM_t = \gamma a_0 + \gamma a_1 \log \left(\frac{PM}{P}\right)_t + \gamma a_2 \log RGDP_t + \gamma a_3 \log \left(\frac{NFA}{PM}\right)_t + (1-\gamma) \log RMM_{t-1}$$

$$= a_0' + a_1' \log \left(\frac{PM}{P}\right)_t + a_2' \log RGDP_t + a_3' \log \left(\frac{NFA}{PM}\right)_t + a_4' \log RMM_{t-1} \qquad \text{....................................(4.4d)}$$

The expected signs are

$a_1' < 0, \quad a_2' > 0, \quad a_3' > 0, \quad$ and $\quad a_4' > 0$

The underlying theoretical for the relationship in equation (4.4d) is as follows. The real GDP is to serve as a portmanteau variable to capture the influence of movements in aggregate economic activity on desired import demand. The more buoyant economy would generate higher income that in turns induce greater spending. Part of this increment would be met through imports. The converse is true under recessionary circumstances. The relative price term in the import demand function is supposed to capture the degree of competition or complementary between imported and domestically produced goods. In the case of competitive imports, the price elasticity is expected to be high; and in the case of complementary imports, the price elasticity to be near zero.

Regarding the incorporation of the net foreign assets, it is intended as a proxy for quantitative restrictions. This is the most common variable being used in the context of developing countries (see Dutta, 1964; Otani and Park, 1976; Rashid, 1984).The rationale is that when foreign reserves are low, quantitative restrictions will be stepped up, and this effectively means a reduction in imports. Another plausible reason is that a misspecification bias could occur if the imposition of quantitative restrictions on imports is not accounted for (Khan, 1974).

The estimated version of equation (4.4d) is reported in Table 4.3. Based on the 3 equations, equations no.3 is preferred after the Cochrance-Orcutt correction for first autocorrelation. It is evident that, relative price seems to be more important than the RGDP in explaining the aggregate import demand in terms of elasticities. The price elasticity estimates are –0.81 for the short-run and 1.65 for the long-run, while the corresponding estimate for real income elasticity are 0.36 and 0.73 respectively. The inelasticity estimates for relative prices implying the relatively complementary rather than competitive nature of aggregate imports. It is not surprising to us owing to the composition of Malaysian imports as outlined earlier in this section that generally does not face domestic competition. It also indicates that the results of the aggregate import demand function relating to Malaysia confirm the generally view that developing countries have a price-inelastic demand for imported goods. This result[14] is conform with Alias (1978), Semudram (1981) and Tan (1987) studies on aggregate import demand function. The statistically significant of relative prices, may be attributable to the occurrence of marked changes[15] in the relative prices in Malaysia over the period under review.

The insignificant of the net foreign assets of the Central Bank or foreign reserves (as a proxy for quantitative restrictions on imports) suggests that changes in the level of foreign reserves do not significantly affect aggregate imports demand. It may also be interpreted that the capacity to import has not been significantly constrained by the availability of foreign reserves. Another plausible reason for the insignificance of net foreign assets is the fact that the imposition of quantitative restrictions by Malaysian's authorities is mainly based on the need to protect domestic industries and not so much on availability of foreign exchange.

TABLE 4.3

REAL IMPORTS (RMM_t)
(Natural Log Terms)

	1	2	3
C	−0.7979 (−1.2725)	−1.1855 (−1.9442)	−1.4056 (−3.8560)
$RGDP_t$	0.0392 (0.2208)	0.1332 (0.8179)	0.3583 (3.3077)
$\left(\frac{PM}{P}\right)_t$	−0.0784 (−0.3062)		−0.8127 (−2.9561)
$\left(\frac{PM}{P}\right)_{t-1}$		−0.2537 (−1.0513)	
$\left(\frac{NFA}{PM}\right)_t$	0.1338 (1.2974)	0.0867 (0.8454)	0.1588 (1.3137)
RMM_{t-1}	0.9228 (8.6048)	0.9018 (9.2074)	0.5071 (6.8289)
$\bar{R}^2$	0.9811	0.9819	0.9942
S.E.R.	0.0912	0.0894	0.0723
h	0.8911	1.1291	1.0429 (C-O)

Note: C-O – Cohrance-Orcutt correction for first autocorrelation.

On the whole, from the equation 3, the adjusted coefficient of determination ($\bar{R}^2$) is about 0.994 and the Durbin-h value that upholds the null hypothesis of non-existence of serial correlation. The coefficient on the lagged dependent term indicates that about 50 percent of the difference between desired and actual demand for imports is eliminated within one year. Hence, equation 3 is selected for incorporation into the model.

4.4.2 Export Function

As Thirlwall (1980) has pointed out, the factor affecting the quantity of goods exported by a country are the same as those affecting a country's demand for imports. Hence, its function is algebraically formulated as follows:

$$RXX_t^* = b_0 + b_1\ YW_t + b_2 \left(\frac{PX}{WCP}\right)_t \qquad \text{.........................(4.4e)}$$

where

RXX_t^* = real exports of goods demanded obtained by deflating nominal exports by the unit value of exports

PX_t = unit value of exports (1985=1.00) as a proxy for export price index

WCP_t = world consumer price index (1985=1.00)

YW_t = world gross domestic product in real terms

The world activity variable is usually approximated by world GDP or GNP in real terms or world trade (see the trade models in Ball, 1973). Thirlwall (1980) has asserted that "all the evidence we have indicates that it is the growth of world income and world trade that is the major determinant of the growth of a country exports" (p.230). The size of the world income elasticity gives an indication of the share of the country's exports in world demand. In the cross country study of 15 Less Developed Countries, Khan (1974) found no significant role for world income in all countries except Chile and Ecuador. Khan attributed his findings to multicollinearity between lagged exports and world income. Nevertheless, the less than unity income elasticity estimates in all cases suggest a declining share of these LDC's exports in world trade.

The inclusion of $\left(\frac{PX}{WCP}\right)_t$ is intended to capture price competitiveness of our exports in the global arena. If the exports sector is not efficiently productive due to the technical limitations of that country, it would push up relative price ratio. In order to correct for misspecification of the relationship when true relationship is a disequilibrium and not and equilibrium one as above, we introduce the partial adjustment mechanism relating the change in exports to the difference between the export demand in period (t−1) as follows:

$$\Delta\, RXX_t = \psi\ (RXX_t^* - RXX_{t-1}) \qquad \text{.............................(4.4f)}$$

where ψ is the coefficient of adjustment.

Substituting equation (4.4f) into (4.4e), we arrive at the following after natural-log transformation:

$$\log RXX_t = \psi\ b_0 + \psi\ b_1 \log YW_t\ \psi\ b_2 \log \left(\frac{PX}{WCP}\right)_t$$

$$+ (1-\psi\ ) \log RXX_{t-1}$$

$$= b_0' + b_1' \log YW_t + b_2' \log \left(\frac{PX}{WCP}\right)_t + b_3' \log RXX_{t-1} \text{.........(4.4g)}$$

The expected signs are:

$b_1' > 0$, $b_2' < 0$ and $b_3' > 0$

Estimation of equation (4.4g) is reported in Table 4.4. From among the equations, equation 2 is considered the most preferred equation.

TABLE 4.4

REAL EXPORTS (RXX_t)
(in natural log terms)

	1	2	3
C	−0.9785 (−1.3094)	−1.0966 (−1.9353)	−0.8778 (−1.0154)
YW_t	0.2435 (1.4774)	0.2933 (2.3072)	0.1329 (0.6915)
$\left(\frac{PX}{WCP}\right)_t$	−0.2521 (−3.0746)	−0.2492 (−3.6804)	
$\left(\frac{PX}{WCP}\right)_{t-1}$			−0.0725 (−0.7288)
RXX_{t-1}	0.8931 (10.951)	0.8602 (13.498)	0.9791 (10.09)
$\bar{R}^2$	0.9869	0.9925	0.9825
S.E.R.	0.0764	0.0578	0.0883
h	0.7400	0.0730 (C-O)	−0.1835

Note: C–O Cohrance-Orcutt correction for first autocorrelation.

It is evident that, the aggregate export are more responsive to world income than to relative price changes. The income elasticity is 0.29 in the short-run, rising to 2.09 in the long-run. The long-run income elasticity of more than unity for exports demand implies that the share of Malaysian's exports in the world demand has not declining as suggested by Khan (1974) for typical LDC's. In terms of price elasticity, the short-run estimate is –0.25 and the long-run estimate is −1.78. The relatively price inelasticity of export demand in the short run could be due to the contractual relationship between Malaysia and her trading partners. It is also worthwhile that, Malaysia exports are made up not only of primary commodities but also non-primary commodities which are predominantly comprises of electronic components[16]. Generally, the prices for the primary and non-primary commodities are determined by world market as well as pricing policy of trans-national corporations. As such, Malaysia ability to influence these prices are limited.

Finally, high $\bar{R}^2$ indicates that the equation 2 capable of explaining about 0.99 percent of variation in export demand. The estimated coefficient of lagged exports is about 0.86. This implies that the speed of adjustment is rather slow, i.e. about 14 per cent of the discrepancy between actual and desired level of exports demand was eliminated in one year. Henceforth, equation 2 of Table 4.4 is identified for inclusion into our model.

4.5 Government Sector

The inclusion of the government sector in the economy is to explain not only the inter-relationship between public and private sector but the monetary sector as well. Such an attempt contributes to an understanding of the whole economy and the effects of certain government policy decision on the rest of the economy. In most macroeconometric models, the public sector is treated asymetrically, in that government revenues are determined endogenously. Government expenditure is customarily assumed to be exogenous. But in our model the government expenditure is endogenously determined. The two major government components expenditure are government consumption expenditure and government investment expenditure. These two components of government expenditure constitute a significant part of GDP itself.

4.5.1 Real Government Consumption

In our model, real government consumption (CG_t) is assumed as a function of the availability of public (government) revenues and lagged real government consumption. The total real government revenue is included in the function because of the obvious reason that government consumption is limited by government revenue. This is consistent with the underlying Peacock Wiseman hypothesis (Peacock and Wiseman , 1967) that the rate of growth of public expenditure are determined by rates of growth of tax revenues. The rationale for using the lagged government consumption is to reflect the government inability to alter its expenditure significantly in the short-run. It is assumed that divergencies between actual and desired levels of government expenditure are eliminated with a time lag, which is partial adjustment model. It provides a type of ratchet effect. The log-linear form estimates of the real government consumption function is given as :

$$\log RCG_t = \underset{(2.9705)}{1.5042} + \underset{(3.2735)}{0.4425} \log \left(\frac{GRV}{P}\right)_t + \underset{(1.9688)}{0.3757} \log RCG_{t-1} \qquad \text{...........(4.5.1)}$$

$$\bar{R}^2 = 0.9907 \qquad h = 0.3800$$

where RCG_t is the real government consumption expenditure, and $\left(\frac{GRV}{P}\right)_t$ is the total real government revenues.

The short-run total revenue elasticity for government consumption expenditure is 0.44, rising to 0.71 in the long-run. This means that almost 71 percent of total government revenue in the long-run goes to meet government consumption. While the statistically significant of the lagged dependent may suggest the essential continuity of government consumption expenditure.

4.5.2 Real Government Investment

The level of public sector investment is embodied in the various development plans, that mainly determined by the level of financial allocation made in the Federal Budget of the Government. Thus we would assume the determinants of the real government investment in our model to be determined by the total real government revenue and the availability of finance particularly from net external borrowing, $\left(\frac{KG}{P}\right)_t$. The previous period's real government investment, (RIG_{t-1}) is also included to denote the influence of on-going projects for which commitments have already been made[17]. Since the existence of the real net external borrowing variable prevented us from estimating in log-linear form, thus the estimated equation in level form is given by:

$$RIG_t = \underset{(-2.2278)}{-815.387} + \underset{(7.6676)}{0.4434}\left(\frac{GRV}{P}\right)_t + \underset{(5.4976)}{0.3969}\left(\frac{KG}{P}\right)_t + \underset{(2.094)}{0.4162}\, RIG_{t-1} \qquad \text{.................(4.5.2)}$$

$$\bar{R}^2 = 0.989 \qquad h = 0.5795$$

The above result revealed that the marginal propensities to invest out of total real government revenues are 0.44 and 0.75 in the short-run and long-run. The relatively high marginal propensity to invest reflect the importance of internal funds particularly form tax revenues in financing public investment projects in the economy. As shown by the equation, the external borrowing is highly significant.. This may also suggest the importance of the external borrowing for the same purpose. The implied short-run and long-run elasticities of the net external borrowing are 0.39 and 0.78, calculated at the sample means.

4.5.3 Government Revenue

Total government revenue (GRV) consists of direct tax (DTX), indirect tax (IDRTX), non-tax revenue (NTXR) and other tax (OTX) as specified below :

$$GRV_t \equiv DTX_t + IDRTX_t + NTXR_t .+ OTX_t$$

For the sake of simplicity, the DTX is endogenously determined whereas IDRTX, NTXR and OTX are treated as exogenous variables in our model. The simplest approach to modeling direct tax revenues is to regress the relevant tax series on an appropriate tax base. The tax base is usually a variable or a set of variables having significant covariant with the particular tax series. The basic form of the tax equation may be written as :

$$T_t = a_0 + a_1 Y_t$$

where Y_t represents tax base, such as aggregate income. Tax equations of this form are found in several macroeconometric models, such as Klein's postwar U.S. model (Klein, 1964); the Wharton EFU model (Evans and Klein, 1967); and the U.K. fiscal policy model (Desai and Henry, 1970). In LDC's, this tax equation may be found in the models of Israel (Evans, 1970); Taiwan (Yu, 1976); Thailand (Chaipravat, 1976); Philippines (Rashid, 1984); and Malaysia (Raja Lope, 1975; Semudram, 1980; Imaoka et al, 1990). In our model, the direct tax is specified to be a function of nominal gross domestic product[18] (GDP). The log-linear form estimates of the direct tax[19] revenue function is given as :

$$\log DTX_t = -3.974 + 1.1021 \log GDP_t$$
$$(-4.3643) \quad (12.9203) \ldots\ldots\ldots\ldots (4.5.3)$$

$$\bar{R}^2 = 0.990 \quad DW = 1.9661$$

The estimates equation (4.5.3) indicates that, the income elasticities of the direct tax is 1.1 and highly significant. This implies that the GDP is an appropriate explanatory variable for the direct tax revenue in the model.

4.6 Money Supply

There has been a growing debate between monetarists and non-monetarists about the question of the ability of the monetary authorities to control the stock of money. Monetarists, in general argue that monetary authorities can exercise effective control of the money supply. They argue that the determination of money supply is part of the simultaneous solution of both the monetary and real sectors of the economy. In this view money supply is not only determined by the policy actions of the monetary authorities but also by the behavior of the public in asset and commodity markets. Monetarists argue that the possibility of monetary authorities controlling money supply is due to the fact that the behavior of the public and banking system is stable and predictable.

In a small open economy such as Malaysia, international trade has important monetary implications (Johnson, 1972). As net foreign assets of the central bank forms one of the main component of the monetary base, its movement induced by external trade flows will produce a corresponding change in the monetary base. The stock of money will in turn change by a multiple of the monetary base changes. Moreover, the currency-preference ratio of the non-bank public and the excess reserve ratio maintained by commercial banks which are components of the money multiplier are endogenously determined by the non-bank public and commercial banks respectively. All this speaks against the exogenous treatment of money supply. Accordingly, money supply cannot stance as an independent policy instrument. Nevertheless, the authorities could still presumably control the stock of money at will but by a complex process of implementing various monetary measures at their disposal. Under such circumstances, the domestic component of the monetary base (net domestic assets) and the statutory reserve requirement ratio may be regarded as monetary policy instruments. As for Malaysian case, Lee and Li (1985) contended that money should be treated as an induced variable rather than an autonomous because external factors affect national income and thereby demand for and supply of money. Bank Negara Malaysia in practice possesses little discretionary power to determine money supply , i.e. money is not an autonomous variable as in the United States (Tan, 1987). Malaysia is a small open economy as the ratio of foreign trade to GNP is high (see chapter 3, pp.18-19).

For the purpose of our study, we have adopted the Friedman-Schwartz model or generally known as money multiplier approach as the analytical framework in our model. At any point of time, the size of money stock and its changes are determined primarily by the behavior of the decision-making units in an economy - the monetary authority, the banking institution, the government, businesses and households. In Malaysia, the central bank influences the money supply through monetary policy via the normal traditional instruments, such as reserve requirements, interests and the like (Bank Negara Malaysia, 1989). Changes in the decision and the practice of maintaining reserves over and above the statutory reserve requirements are the channel of influence on money supply of commercial bank. For the government, its impact is transmitted through fiscal policy or budgetary decisions while the private sector (businesses and households) influences the money stock through the adjustment of its financial portfolio, e.g. the decision to hold more or less currency toward other financial assets. Thus, an analysis of the money supply determination may be made based upon a model which captures the respective behavioral patterns of these economic units

The basic framework of the money multiplier approach is that variation in money supply is effected via two main channels:

1) the high-power money (reserve money) or the monetary base

2) the money-multiplier which in turn is determined by generally three different elements two of which may have their respective behavioral functions, namely the currency-preference ratio, the volume of excess reserves maintained by commercial banks vis-a-vis their total deposits, and the exogenous required reserves prescribed by the Central Bank.

Based on this analytical framework, we can view that the behavior of money supply is in fact a reflection of a complex interaction of decisions made by various economic sector and can only be analyzed as an integrated part of the entire economic system.

4.6.1 Money-Multiplier Analysis[20]

A money multiplier provides the connection between the monetary base and the supply of money. The Central Bank of Malaysia's definition of money consists of coins, currency notes and demand deposits held by the private sector (M1) plus quasi-money, money supply[21] (private sector liquidity or M2). Thus, the relationship between money supply (M2) and monetary base (MB) can be specified as follows:

$$M2 \equiv mMB \qquad \text{.......................................(4.6a)}$$

where m is the money multiplier.

The above identity expresses the money (M2) expansion process as some multiple (m) of monetary base (MB). With respect to monetary base, we opt to view it from the supply side[22]. Hence, monetary base (high-powered money or reserve money) is defined as

$$MB \equiv NFA + GB + BR + OIF \qquad \text{.............................(4.6b)}$$

where NFA = net foreign assets of the Central Bank

GB = Central Bank credit to the government (usually net government deposits with the central bank and consisting primarily of its portfolio of government or securities)

BR = Central bank credit to commercial banks

OIF = Residual assets minus residual liabilities of the Central Bank.

The monetary base has been defined in such manner that it solely includes the Central Banks' items. Changes in high-powered money can occur through changes in net foreign assets of the central bank (international reserves), changes in the central bank's claims on the government, and changes in the central bank's claims on commercial banks, we can write

$$\Delta MB_t \equiv \Delta NFA_t + \Delta GDEF_t + \Delta BR_t + OIF_t$$

or

$$MB_t \equiv \Delta NFA_t + \Delta GDEF_t + \Delta BR_t + OIF_t + Mb_{t-1} \qquad \text{..........(4.6c)}$$

In order to meet our model more convenient and for operational needs, the above identity (4.6c) can be simplified as follows:

$$MB_t \equiv \Delta NFA_t + \Delta GDEF_t + ERR3_t \qquad \text{....................(4.6d)}$$

where ΔNFA is the change in the net foreign assets ($NFA_t - NFA_{t-1}$); $\Delta GDEF$ is simply the reflection of the changes in the government budget deficit or fiscal deficit[23] ($GDEF_t - GDEF_{t-1}$); and ERR is the residual required to make the data holds in the identity[24]. The inclusion of the government fiscal deficits item is basically to see the effects of the government spending on the monetary base[25]. An increase in the fiscal deficit is thus assumed to result in an equal change in the monetary base. This would be true to the extent that government deficits were financed by borrowing from the central bank. Thus, in our model, we assumed that the government budget deficit is totally financed by the Central Bank. The academic literature has always maintained the distinction between government deficits financed by commercial banks and deficits financed by the central bank. The former does not alter (at least directly) the base and generally has negligible effects on the multiplier and thus on the money supply, while the latter increases directly the monetary base and yields a multiple increase in money supply (Coats and Khatkhate, 1980, p.19). Thus, any changes in the monetary base will indirectly reflected the changes in money stock via the government fiscal deficit.

In equilibrium, the supply (sources) of the monetary base must equal its demand (uses). Hence the equilibrium condition follows as

$$MB = C + R$$

$$MB = C + SRD + E \quad \text{.................................(4.6e)}$$

where

C = currency in circulation in the hands of the non-bank public

R = total reserves of commercial banks, i.e. statutory reserves (SRD) + excess reserves (E).

Assuming that currency and reserve demand are proportional to deposits. we get the following relationships:

$$C = CrD$$

$$SRD = SD$$

$$E = ExD$$

where Cr = currency-deposit ratio

S = statutory reserve ratio[26]

Ex = demand deposits (DD) + time and savings deposits (TSCB).

Dividing total money stock (M2) by equation (4.6e), we obtained the money multiplier (m) in terms of its component ratios

$$m = \frac{C + E + TSCB}{C + SRD + E}$$

$$= \frac{Cr\,(D + TSCB +) + TSCB}{Cr\,(D + TSCB) + S\,(D + TSCB) + Ex\,(D + TSCB)}$$

$$= \frac{(1 + Cr)\,(D + TSCB)}{(Cr + S + Ex)\,(D + TSCB)}$$

$$= \frac{1 + Cr}{Cr + Ex + S} \qquad \text{..............................(4.6f)}$$

Until 1969, the statutory reserve ratio was never seen as a necessary policy instrument of demand management by central bank. Accordingly, the ratio had generally remained constant until then when the economy started booming (Lin, 1977). Variation in the ratio has a profound effect on the size of the multiplier and hence the quantity of money resulting from a given base or change in the base. It is potentially one the most important instruments of monetary control in LDC'c, though its uses introduces some degree of inflexibility in the operation of monetary policy. (Coats and Khatkhate, 1980, p.21; Park, 1973,p.400). In our model the ratio is regarded as an exogenous variable.

4.6.2. Currency-Deposit Ratio

The currency-deposit ratio (Cr) and the excess reserve ratio (Ex) each has its own behavioral function. Several studies have been carried out on the determinants of the ratio such as in the United States by Cagan (1958), Hess (1971), Becker (1975), Aghevli (1980) and Garcia and Park (1979). Among developing countries, the case of Venezuela has been studied Khatkhate, Galbis and Villanueva (1980) who found that the logarithms of both the interest rate and income are negatively related to the logarithm of the currency ratio. Another variable that is worth to consider as important is inflation rate, which determine the choice between currency and deposits This variable is expected to be positively related to the currency-deposit ratio because an increase in prices is likely to increase the demand for currency for transaction purposes[27].

In our model, the desired currency-deposit ratio is assumed to be a function of real income, the interest rate on bank deposit and the inflation rate is specified as follows :

$$Cr_t^d = g_0 + g_1\, RGDP_t + g_2\, R_t + g_3\, (P_t - P_{t-1}) \quad \text{..................(4.6g)}$$

A priori expectation is that both g_1 and g_2 are negative, while g_3 is positive.

The underlying rationale for anticipating a negative coefficient of income is that currency is often regarded an inferior good in relation to deposits. Therefore, as income increases, the public may shift its preference towards holdings income-yielding assets like fixed or savings deposits on security grounds. Regarding the interest rate, its inclusion is to accommodate the notion of opportunity cost of holding currency instead of deposits. As interest rate rises, the return forgone for holding wealth in the form of currency will increase. The positive relationship between the inflation rate with the currency ratio is that, as inflation rate increases, the demand for currency for transaction purposes will increase[28].

Assuming that the public may adjust this ratio to the desired level, then a change in the ratio is a given fraction of the gap between the desired ratio and the actual ratio in the previous period :

$$\Delta Cr_t = \phi \left(Cr_t^d - Cr_{t-1}\right) \qquad \text{.............................(4.6h)}$$

Substituting (4.6g) into (4.6h), we obtain the following after natural-log transformation :

$$\begin{aligned} Cr_t &= \phi\ g_0 + \log\phi\ g_1 \log RGDP_t + \log\phi\ g_2 \log R_t \\ &\quad + \phi\ g_3 \log(P_t - P_{t-1}) + (1-\phi) \log Cr_{t-1} \\ &= g_0^{'} + g_1^{'} RGDP_t + g_2^{'} R_t + g_3^{'} (P_t - P_{t-1}) + g_4^{'} Cr_{t-1} \qquad \text{......(4.6i)} \end{aligned}$$

The expected signs are :

$g_1^{'} < 0$, $g_2^{'} < 0$, $g_3^{'} > 0$, $g_4^{'} > 0$

Estimating equation (4.6i) using the various types of interest rates (such as 3 to 12-month fixed deposit rates; 3 to 12-month treasury bill rates and saving deposits rates) are reported in Table 4.5. The signs of all the estimated coefficients tally with expectations. In equation 3, real income appears to have significant influence though its coefficient is rather small. This indicates that the currency-ratio respond very inelastically to the changes in income.

TABLE 4.5

CURRENCY-DEPOSIT RATIO (Cr_t)
(in natural log terms)

	1	2	3	4	5	6	7
C	0.6634 (1.1618)	0.8593 (1.5163)	0.9557 (1.6779)	0.8727 (1.3261)	0.9667 (1.1902)	1.0847 (1.6936)	1.0191 (1.5750)
$(RGDP)_t$	−0.0630 (−0.9886)	−0.0818 (−1.3017)	−0.1129 (−1.7906)	−0.0933 (−1.2547)	−0.1024 (−1.4166)	−0.1110 (−1.5873)	−0.1159 (−1.6410)
$RFD3_t$	−0.1308 (−3.2131)						
$RFD6_t$		−0.1493 (−3.1365)					
$RFD12_t$			−0.1690 (−3.0466)				
$RTB3_t$				−0.0823 (−1.1956)			
$RTB6_t$					−0.0878 (−1.2145)		
$RTB12_t$						−0.1110 (−1.5064)	
RSD_t							−0.0672 (−1.2453)
$P_t - P_{t-1}$	0.5492 (1.6399)	0.6387 (1.8333)	0.9160 (2.2974)	0.2060 (0.5692)	0.2188 (0.5983)	0.2375 (0.6578)	0.5105 (1.1504)
Cr_{t-1}	0.8729 (11.6967)	0.8426 (11.3921)	0.8271 (11.115)	0.8563 (9.7301)	0.8447 (9.8453)	0.8351 (9.9926)	0.8125 (9.5069)
$\bar{R}^2$	0.9857	0.9856	0.9853	0.9809	0.9810	0.9815	0.9811
S.E.R.	0.0582	0.0586	0.0591	0.0673	0.0673	0.0662	0.0671
h	0.0969	0.0844	0.0527	1.1571	1.0251	0.9220	0.8867

Regarding the interest rate, the 12-month fixed deposits rate is found to be a significant explanatory variable though its elasticity is quite small. The results suggest that though currency is an inferior good and an insecure form of money held for transaction purposes, it cannot be ruled out in the model. The coefficient of the rate of inflation is highly significant with the positive signs. This implies the need for currency in times of inflation for transaction purposes. The larger coefficient of inflation may suggest that currency holders appear to respond more to a given change in inflation than interest rate (i.e. the opportunity cost of holding currency is rather high). This also suggest Malaysian public are aware of the costs that inflation imposes on currency holdings. As indicated by the coefficient of the lagged dependent variable, the speed of adjustment is rather slow. The coefficient being about less than 0.18 (i.e about 18 percent of the discrepancy between actual and the desired level of currency ratio was eliminated in one year). On the whole, the equation is capable of explaining about 98 percent of the variation in the ratio and the possibility that the serial correlation problem exists is ruled out by the h-value. Hence equation (3) is selected for incorporation into the model.

4.6.3 Excess Reserve Ratio

Practically, commercial bank usually maintain a quantum of reserves over and above the required quantum as a matter of prudence policy, i.e. the ability to meet any unusually large withdrawal demands by public. Failure by any bank to meet withdrawals requests would shatter public confidence in it. Moreover, banks are usually penalized if they overdraw their clearing balances. The commercial banks by maintaining this large reserves as keeping cash at the vaults or maintaining large clearing balances with the Central Bank do not yield them any return (i.e. the cost involved in this practice is the foregone of the monetary return).

Therefore, it may be postulated that a rise in the interest rate, may induce banks to extend more loans in the money market and thereby reducing the excess reserves[29] and vice versa. These interest rates may determine the excess reserve ratio as they are yields on the liquid assets that can be easily realizable. On the question of banking prudence, it is postulated that the ratio varies directly with the proportion of demand deposit to aggregate non-demand deposit liabilities (fixed and savings deposits) of commercial banks. Thus the excess reserve ratio function of the commercial banks using the stock adjustment model (in the log linear form) is specified as negatively related to the interest rate (3, 6 or 12-month Treasury Bill rate, prime rate) and positively related to demand deposits to total fixed and savings deposits is specified as follows:

$$Ex_t = \delta h_0 + \delta h_1 \log R_t + \delta h_2 \log DFS_t + (1-\delta) \log Ex_{t-1}$$
$$= \delta_0' + \delta_1' R_t + \delta_2' DFS_t + \delta_3' Ex_{t-1} \qquad \text{..........(4.6j)}$$

where DFS is the ratio of demand deposits to total fixed and savings deposits with commercial banks and (1−δ) is the coefficient of adjustment. The results of estimating equation (4.6j) are reported in Table 6. With the exception of equation 8, the interest rate coefficient unexpectedly bears a positively sign. It is insignificant in all the equations except equations 5 and 8. The proportion of demand deposit to total non-demand deposit liabilities of commercial banks is the sole highly significant determinant of excess reserve ratio. This variable consistently displays a positive sign in all the abovementioned 4 equations and capable of explaining more than 93 percent of variation in the ratio. Additionally, it may postulated that the aggregate income of the economy is a significant argument in the function as commercial banks may reduce their excess reserves in times of economic buoyancy as their lending activities then would yield them more returns. This variable is related negatively to the excess reserve ratio. By adding the income variable to the right-hand side of the estimating equation yields results as shown in Table 4.6.

TABLE 4.6

EXCESS RESERVE RATIO (Ex_t)
(in natural log terms)

	1	2	3	4	5	6	7	8
C	−3.6033 (−6.4383)	−3.4899 (−.5.8159)	−3.5256 (−5.4815)	−4.2095 (−4.5081)	−3.5186 (−2.9187)	3.2598 (2.6338)	3.1835 (2.5696)	3.5733 (2.9517)
DFS_t	1.5288 (7.002)	1.5157 (6.6251)	1.5192 (6.6491)	1.6550 (6.2687)				
$RGDP_t$					−0.6083 (−3.4741)	−0.5530 (−3.1017)	−0.5422 (−3.0438)	−0.4285 (−2.5986)
$RTB3_t$	0.1556 (0.9258)				0.3283 (1.8704)			
$RTB6_t$		0.0933 (0.5349)				0.2241 (1.1639)		
$RTB12_t$			0.1034 (0.5107)				0.2091 (0.2091)	
RPL_t				0.3426 (1.1586)				−0.4984 (−1.8781)
Ex_{t-1}	−0.3533 (−1.9781)	−0.3434 (−1.8040)	−0.3489 (−1.8280)	−0.4259 (−2.0575)	0.3161 (1.7733)	0.3688 (2.0288)	0.3748 (2.0529)	0.4424 (2.6313)
$\bar{R}^2$	0.9444	0.9428	0.9428	0.9451	0.9105	0.9035	0.9025	0.9106
S.E.R.	0.1326	0.1344	0.1345	0.1317	0.1682	0.1747	0.1756	0.1682
h	0.4767	2.0885	2.1029	2.1664	0.7253	1.8606	2.028	1.8756

Only in equation No.8, the income variable and the interest rate proxied by the prime lending rate have the correct signs and appear to be statistically significant and capable in explaining about 91 percent of variation in the ratio. Hence, equation 8 is preferred for incorporation in our model.

4.6.4 Price Level

The two major theories of price or inflation behavior are attributed to the monetarists and the structuralist. According to the monetarists, inflation arises from an excessive growth of money supply, while the structuralists trace its roots to the structural imbalances in the economy. Another factor that is important as an argument in the price equation is import price[30]. This variable is used to trace the extent of imported inflation. For the sake of simplicity and the purpose of our study, the price is assumed to be a function of nominal money supply (as proxy for unemployment), nominal income or output and import price. In our study, this equation is specified in logarithmic form as follows:

$$\log P_t = f_0 + f_1 \log M2_t + f_2 \log GDP_t + f_3 \log PM_t \quad .....(4.6j)$$

where P_t = consumer price index (1985=1.00)

$M2_t$ = nominal money supply

GDP_t = nominal gross domestic product

PM_t = unit value of import (1985=1.00)

Assuming that, the effect of inflationary expectation on the current level of price is represented by the lagged endogenous variable, P_{t-1}. Hence, the equation (4.6j) with lagged adjustment mechanism incorporated may be specified as follows :

$$\begin{aligned} \log P_t &= \xi f_0 + \xi f_1 \log M2_t + \xi f_2 \log GDP_t + \xi f_3 \log PM_t \\ &\quad + (1-\xi) \log P_{t-1} \\ &= f_0' + f_1' \log M2_t + f_2' \log GDP_t + f_3' \log PM_t \\ &\quad + f_4' \log P_{t-1} \quad ....(4.6k) \end{aligned}$$

The expected signs are

$$f_1' > 0, \quad f_2' > 0, \quad f_3' > 0 \quad \text{and} \quad f_4' > 0$$

The estimated equation (4.6k) is reported in Table 4.7.

TABLE 4.7

PRICE LEVEL (P_t)
(in natural log terms)

	1	2	3	4
C	−1.0561 (−1.8638)	−2.1654 (−3.5358)	−1.5372 (−5.1931)	−1.8015 (−5.1374)
$M2_t$	0.0448 (0.8491)	0.0099 (0.1456)		
$M2_{t-1}$			0.0404 (1.8206)	0.0676 (1.1879)
GDP_t	0.0511 (0.6317)	0.1822 (2.2272)	0.0977 (2.7894)	0.0954 (1.4522?)
PM_t	0.1559 (3.4525)		0.1317 (5.0137)	
PM_{t-1}		0.0720 (1.2059)		0.1166 (2.2015)
P_{t-1}	0.5223 (4.8066)	0.4054 (2.3233)	0.4435 (6.067)	0.3725 (3.0485)
$\bar{R}^2$	0.9973	0.9962	0.9978	0.9961
S.E.R.	0.0194	0.0229	0.0174	0.0233
h	0.3323	1.9955	0.7758	2.5470

It can be observed from the table that, all the coefficients in the four equations bear the correct signs. The nominal money supply and income are not statistically significant in equation 1 and 2. While the income variable is statistically significant in equation 2 and 3. The import price is highly significant in equation 1 and 3. Therefore, the equation 3 is considered the most preferred equation. From equation 3, import price appears to be one of the major factors influencing the domestic price level. The coefficient of this variable indicates that a 10 per cent increase in the import price leads to a 1.3

per cent increase in the domestic price level. While the coefficient of lagged one-period money supply is about 0.04. This implies that the sensitivity of the price level to the changes in nominal money supply lagged one-period is very weak; i.e. a 10 per cent increase in money supply only induce a 0.4 per cent increase in the price level with a lag one-period. This may suggest that the expansionary monetary policy would not immediately fuel the inflation, but only the latter year with very low inflation. With respect to the nominal income, the response of price changes to it is rather weak based on the value of the elasticity; i.e a 10 per cent increase in nominal income leads to about 1 per cent increase in price level. Finally the lagged endogenous variable representing the effect of inflationary expectation on the current level of price is highly significant with a correct signs. Hence, equation 3 is picked for incorporation into our model.

4.7 Aggregate Demand and Other Identities

Gross domestic product in constant prices, GDP_t, may be written as:

$$RGDP_t \equiv RCP_t + RIN_t + RIG_t + RCG_t + STCK_t + RXX_t - RMM_t$$

where variables are as previously defined; STCKt is the change in stocks, is assumed to be exogenously determined. All variable are in constant 1985 prices, GDPt in current prices is derived as follows:

$$GDP_t \equiv (RGDP_t)*P_t$$

where P_t consumer price index (1985=1.00) as a main aggregate deflator.

Real disposable income, Yd_t is assumed approximated by GDP_t less direct tax revenue, DTX_t and divided by P_t :

$$Yd_t \equiv \left(\frac{GDP_t - DTX_t}{P_t} \right)$$

The monetary sector can be further intergrated with the real sector through the identity for monetary base, MB_t. The channel through which the impact of the real sector is transmitted is via the changes in the size of government budget or fiscal deficit. This variable is assumed as a main component in MB_t. This identity was already specified earlier in the previous section defined as follows:

$$MB_t \equiv \Delta NFA_t + \Delta GDEF_t + ERR3_t$$

The net foreign assets of the central bank, NFA_t is equal to that of the previous period, NFA_{t-1} plus balance of payments, plus the error terms, $ERR2_t$:

$$NFA_t \equiv NFA_{t-1} + BOP_t + ERR2_t$$

where BOP_t is the balance of payments and defined as :

$$BOP_t \equiv(RXX_t * PX_t) - (RMM_t * PM_t) + KP_t + KG_t + ERR1_t$$

where RXX_t is aggregate real exports; PX_t is unit value of exports (1985=1.00); RMM_t is aggregate real imports; PM_t is unit value of imports (1985=1.00); KP_t is net inflow of private long-term capital; KG_t is net government borrowing from abroad and $ERR1_t$ is the residual defined so that the balance of payments identity holds in the data. The variables KP_t and KG_t are treated as exogenous.

Finally the net liquid assets term, NLA_t which is a determinant of total private consumption expenditure is defined as:

$$NLA_t = M2_t + LA_t$$

NLA_t is therefore comprised of the private sector liquidity or money stock less total loans and advances.

Notes to Chapter 4

1. A review of these theories can be found in Evans (1969) and Thomas (1985)

2. As highlighted by Evans (1969), the determinants of expenditure on durables are different from that of non-durables and therefore should be treated separately. As such, a better approach to analyze the private consumption function is to separate it into consumption of durables and non-durables. As noted previously, due to data limitation, such separation is not make possible in this study. In any case, the majority of empirical studies on consumption function are either based on total consumer expenditure or consumer expenditure on non-durables (see for examples the survey by Thomas (1985); Qua (1986) and Semudram (1980) for Malaysia case.

3. In empirical work, lack of adequate data on wealth has frequently led to the use of liquid assets as a proxy for total wealth, see Patinkin (1965), Ferber (1973) and Townend (1976).

4. This method was employed by Qua (1986) in the consumption function for non-durables good.

5. This variable is used as a main deflator throughout the model.

6. These results are in agreement with Ho (1983) findings, that, the real money supply (M2) as a proxy for liquid assets in the consumption function in his annual model also turn out to be insignificant and has unexpected sign.

7. This estimate is lower than that obtained by Tan (1987) of 4 percent. This could be due to the using of real money supply (M2) as a proxy for liquid assets. Whereas in our study we employed M2 less total loans and advances to the private sector as a proxy for net liquid assets.

8. Ewis and Fischer (1985) for example contended that for the developing economies, it is conventional wisdom that quantitative variables such as the availability of credit and foreign exchange that often dominate the market variables that originate from a more neo-classical formulation in the investment function. Other studies by Van Wijnbergen (1982), Blejer and Khan (1984), Lim (1987) and Dailami (1990), for example, found that in the repressed financial markets typical of many developing countries, credit policy affects investment directly, because credit is allocated to firms with access to preferential interest rates.

9. For the sake of simplicity, the foreign capital inflows or foreign direct investment is treated as exogenous variable as this variable generally more influence by the political factor. See study by Lucas, Robert E.B. (1993), "On the Determinants of Direct Foreign Investment : Evidence from East and Southeast Asia", *World Development*, Vol.21, No.3, pp.391-406.

10. See Esa, Halipah (1990), "Capital Stock and Determinants of Investment Behaviour in Malaysia", pp.42-43. See also Ramstetter, Eric D. (1991)

11. Initially net foreign assets (NFA) was included in the equation as a proxy for the availability of foreign exchange as explanatory variable as proposed by Ewis and Fischer (1985). But this variable appeared to be insignificant. Moreover, when the equation with the NFA as explanatory variable was experimented upon in our model simulation, it led not only to generally parallel divergence between the actual and dynamic simulated values of several equations in the model but also to inexplicably perverse results in our policies simulation. Hence this variable is dropped from the equation. In contrast, Semudram (1980) found that the NFA was statistically significant and has the correct sign. This may be due to the different sample periods as well as different specification he employed in his model. Whereas In other studies for developing countries, Naqvi, S. N. H. and Khan A. H. (1992) found that the foreign direct investment variable was statistically significant but bear a negative sign in the investment function for the Indian model. But in our model, the foreign direct investment variable appears to have correct sign and statistically significant.

12. In contrast Qua (1986) found a positive relationship between the private fixed investment in machinery and equipment with the government investment expenditure. It is worth noting that, Qua has disaggregated the total investment function into private fixed investment in machinery and equipment, and private fixed investment in building and other construction. Moreover, these investment function were estimated by three stage least square (3SLS) estimator method.

13. For more details on this issue, see Wong and Wai (1982, p.32) and Servene L.and Solimano A. (1992, p.100).

14. Alias (1978) obtained an income elasticity of approximate 0.7, while Semudram (1981) and Tan (1987) analysis of aggregate imports yielded 0.39 and 0.283 respectively. Hence, our estimates elasticity of income is quite close to that calculated by Semudram. Concerning the elasticity of relative price of aggregate imports demand, Alias reported about 0.8 and statistically significant, whereas Tan reported is much lower, approximately 0.13 and statistically insignificant.

15. It is argued in the literature on import demand functions (Orcutt, 1950; Kindleberger, 1973) that the relative-price elasticity of demand for imports will vary with the magnitude of price changes. A variation of this argument (Leamer and Stern 1970) is that the adjustment of import quantity to large price changes is more rapid than the adjustment to small changes in prices. Though, the coefficient of relative price is inelastic in our aggregate imports demand function, but the statistically significant implies the existing of relative prices variability during the period under study and this indicates that relative prices have significant effect on imports. As contrary to Semudram (1981) and Tan (1987) reported, the insignificance may be attributable to the lack of variability in the relative prices exist in the demand for imports in Malaysia. We shall point out here that the result

from our study is different from Semudram and Tan partly may be due to the different sample periods as well as the base year for the import and consumer price index that used in the analysis.

16. Electrical and electronic items constituted 52.1 percent of Malaysia total exports of manufactured goods in 1985, 56.6 percent in 1990 and 58 percent in 1991 (Economic Reports, various issues).

17. According to Qua (1986), in the case of government investment in Malaysia the inclusion of the lagged dependent term reflects the practice of fund disbursements, which are usually on annual basis.

18. There are several forms for tax base proxy are used. For instance, in Qua (1986) study, nominal net national product was used for individual income tax; Semudram (1980) use nominal GDP as a proxy for direct tax function, and in MIER Annual Model by Imaoka et al (1990), nominal GNP has been used for this purpose.

19. In our model, the direct tax revenues is derived from households and corporations.

20. There are several studies regarding the money-multiplier approach in the process of money supply particularly for Malaysia case. For some excellent example , please see Lin, S.Y. (1977), Semudram, M (1980) and Yap, M.C. (1990).

21. Regarding to the monetary aggregate, the M2 definition is preferred to M1 as the relationship between the latter (i.e. currency in circulation plus demand deposits) and spending may be affected by the easy convertibility of other interest-yielding financial-yielding assets (savings and time deposits) into actual means of payment whenever the need arises with little risk and at low cost. Such assets are specified by Friedman as "temporary abodes of purchasing power". Money should be as such given a broader definition as the degree of substitutability may be such that a more stable empirical relationship may be found between the broader aggregate and income (Coats and Khatkhate, 1990). On the other hand, M3 definition is not chosen as deposits with non-bank financial institution are relatively small. So will be the difference in quantum between these two monetary aggregates. Moreover, commercial banking operations are much on a larger scale in Malaysia relative to other financial intermediaries.

22. In the economic literature of money and banking, there are two aspects to base money - supply and demand. The supply side is the asset side of the central's bank accounts and it is considered as the primary source of its base money liabilities. An examination of these "sources" guides an analysis of these "sources" provides an understanding of the influence of other sectors have on money's behavior. The demand side is the liability side of the central's bank accounts and often known as "uses" side.

23. The government fiscal deficit defined as the difference between government total
expenditure (G) and total tax revenue (GRV). This aspect will be analyzed in the latter section in this chapter.

24. In this identity, the ERR term consists of central bank's claims on commercial
banks, residual items of the central bank and the previous year monetary base (MB_{t-1}). The ERR item is exogenously determined in the model.

25. It is worth noting that the government budget deficit apart being financed by the central bank, it may also be financed from the taxes on income and the like. In our model, the government fiscal deficit item forms one of the main component in the money base and serves as an avenue between the real and monetary sector. An expansionary of government expenditures, such increase in government investment, *ceteris paribus* will increase the fiscal deficit and this in turn will affect the money base and finally the multiple increase in money supply. In fact this is an indirect influence of fiscal transmission mechanism from the real sector (government expenditure). The channel through which the fiscal changes is transmitted is via government budget deficit. Hence, the government budget deficit act as a channel between the real and monetary sector (the fiscal deficit will be discuss later in the following section in this chapter).

26. Effective form March 15, 1979, statutory reserve ratio applicable to commercial banks is expressed in terms of total eligible liabilities of commercial banks comprising of demand deposits, fixed and savings deposits and other eligible liabilities of commercial banks. Nevertheless, for simplicity purposes, we have treated the published series of this ratio as if it is defined in terms of total deposits which may not involve too much a sacrifice of accuracy

27. This proposition is found in Semudram (1980) study, which the inflation rate variable is found to be positively related to currency ratio. But, it is also possible that, if the variable represents the opportunity cost of holding currency, then it is expected that to be negatively related to the currency ratio. As public expect the rate of inflation to accelerate, they will get rid off their money holding in preference for goods or real assets. Since the value of currency holdings falls in terms of its purchasing power. Thus, it is diffficult to decide, a priori, whether the inflation rate is positively or negatively related to currency-ratio. The question can be decided only empirically and this is how we approached it. Hence, in our model, for simplicity purposes, we assume that the inflation rate is positively related to currency-ratio.

28. In Semudram (1980) study, that the inflation rate variable is found to be positively related to currency ratio. But, it is also possible that, if the variable represents the opportunity cost of holding currency, then it is expected that to be negatively related to the currency ratio. As public expect the rate of inflation to accelerate, they will get rid off their money holding in preference for goods or real assets. Since the value of currency holdings falls in terms of its purchasing power.

Thus, it is diffficult to decide *a priori* whether the inflation rate is positively or negatively related to currency-ratio. The question can be decided only empirically and this is how we approached it. Hence, in our model, for simplicity purposes, we assume that the inflation rate is positively related to currency-ratio.

29. Excess reserves is defined to comprise vault cash of commercial banks plus their clearing balance accounts with the central bank.

30. As Malaysia economy is relatively open, the import prices are expected to have widespread influence on domestic price situation. It was estimated that increases in import prices accounted for about 30 percent of the growth in consumer prices in 1973 and 1974 in the first round (Ho, 1983, p.159).