CHAPTER VII

ESTIMATION AND INTERPRETATION OF MACROECONOMETRIC MODEL

7.1 Descriptive Statistics of the Model

In macroeconometric model used in this thesis, whether a given data series approximates the normal distribution can be evaluated initially by checking whether the mean [21] and the median [22] are nearly equal, whether the Skewness [23] is approximately zero, and whether the Kurtosis[24] is close to 3. A more scientific test of normality can be judged by examining the *Jarque-Bera statistic*[25] (Eviews Manual, 2006). Under the null hypothesis of a normal distribution, the Jarque-Bera statistic is distributed as with 2 degrees of freedom. The reported Probability is the probability that a Jarque-Bera statistic exceeds (in absolute value) the observed value under the null hypothesis-a small probability value leads to the rejection of the null hypothesis of a normal distribution.

In Table 7.1, it has been found that endogenous data series for GDP, capital in service sector, and disposable income of the economy has a large difference between its mean and median that prohibits treating them as a normal distribution. However, the third moment (Skewness) and fourth moment (kurtosis) values of these data series are approximately equal to 0 and 3 respectively that satisfy the properties of a normal distribution. Hence, by avoiding some extreme figures, it can be determined that all data series associated with the model are normally distributed.

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[21] Mean is the average value of the series, obtained by adding up the series and dividing by the number of observations.

[22] Median is the middle value (or average of the two middle values) of the series when the values are ordered from the smallest to the largest. The median is a robust measure of the center of the distribution that is less sensitive to outliers than the mean.

[23] Skewness is a measure of asymmetry of the distribution of the series around its mean.

[24] Kurtosis measures the peakedness or flatness of the distribution of the series.

[25] Jarque-Bera is a test statistic for testing whether the series is normally distributed. The test statistic measures the difference of the skewness and kurtosis of the series with those from the normal distribution.

Table 7.1: Descriptive statistics of Endogenous Variables Based on Individual Samples

Endogenous Variables	Mean	Median	Skewness	Kurtosis	Jarque-Bera
CAD	-11406	-11838	-0.045041	2.892344	0.01642
CONSUMP	1166046	1158148	0.057683	1.727514	1.360443
CREDP	206878.8	175512.1	0.609164	2.240005	1.718265
DD	44340.70	33899.00	0.533900	2.008551	1.769309
GBD	14441.75	6950	1.620993	4.658295	11.05035
GCE	51019	43925.5	0.500837	2.067214	1.561202
GDE	1410678	1363709	0.320319	1.928334	1.299071
GDP	1370416	1303812	0.478044	2.067691	1.486087
GDPV	1133675	1054234	0.479714	2.118948	1.413962
GI	82326.75	88486	0.20686	2.07199	0.860306
IAGR	53389.69	52408.35	0.199083	2.613311	0.25672
IAGRP	27314.35	27052.4	0.416405	2.47814	0.804924
IMAN	33910.56	28360.75	1.32458	4.055463	6.776709
IMANP	24571.71	19997	0.860032	2.337461	2.831315
INV	248993.7	218773.5	0.815703	2.548242	2.387978
ISER	161693.4	146018.4	0.600108	2.145158	1.809396
ISERP	114780.9	96725.85	0.824799	2.509349	2.468258
KAGR	581100.8	584762.8	-1.128918	3.688052	4.642703
KMAN	326400.1	286477.8	0.535116	1.788409	2.177792
KSER	1758262	1594961	0.715331	2.418738	1.987215
M	285817.7	236510	0.677029	2.404896	1.823019
MC	0.53546	0.543245	0.154461	2.639382	0.187899
MF	2.335466	0.974682	2.030851	6.442927	23.62597
MK	3.894118	4.073257	-0.231543	1.799657	1.379393
MR	16.16782	15.58713	0.185151	1.668222	1.592296
MV	148316.2	111382.5	0.915601	2.483508	3.016719
PGDP	0.768184	0.808155	-0.134956	1.836007	1.189777
REVIN	35002.7	31803	0.268709	1.665358	1.725073
REVM	38196.05	29709	0.455674	1.693944	2.113615
REVNT	17735.3	12180	0.579756	1.847973	2.226364
REVT	28137.8	24562	0.593646	2.243439	1.651707
TREV	119071.9	123705	-0.077179	1.717426	1.390686
VAGR	307211.3	315591.5	0.215428	2.221601	0.659618
VMAN	180732.8	161148	0.506267	1.906621	1.850585
VSER	882472.1	827072.5	0.503895	2.086974	1.541047
XFF	53.92123	54.12406	-0.299491	2.35784	0.642624
XJ	1.624132	1.692331	-0.2358	2.028703	0.97152
XJM	3.17007	3.010622	2.394481	9.593596	55.34139
XL	118.8783	115.1805	0.172624	1.91556	1.079339

XN	4.671155	1.691924	1.25922	3.08103	5.290926
XRMG	496.4404	518.447	0.095418	1.449494	2.033739
XT	25.67144	25.58033	-0.542991	2.895028	0.991981
XV	92935.7	54244	1.028694	2.713033	3.595997
YD	1252040	1180857	0.575544	2.152495	1.702722

In Table 7.2, it has been visualized that all exogenous data series of the model used in the thesis have satisfied the general conditions of normal distribution. That is, there is a very negligible difference between its mean and median values, and the Skewness and Kurtosis values of all exogenous data series are approximately tends to be 0 and 3 respectively. Therefore, all data series regarding 53 exogenous variables and 44 endogenous variables are normally distributed, which is one of the most important primary conditions to achieve convergence in model simulation.

Table 7.2 Descriptive Statistics of Exogenous Variables Based on Individual Samples

Exogenous Variables	Mean	Median	Skewness	Kurtosis	Jarque-Bera
CAGRP	35788	36580	0.060889	2.196361	0.550555
CCR	14.0285	14.09	-0.60159	2.618101	1.327908
CMANP	75640.67	67686.15	0.570894	2.209057	1.607724
COB	42158.2	34000.5	0.599411	2.058969	1.935596
CSERP	95450.15	69685.5	0.736744	2.320288	2.194311
DA	0.084789	0.085057	-0.60704	3.15047	1.247184
DM	0.052638	0.062867	-0.53636	2.367694	1.292097
DS	0.025335	0.0238	0.057342	1.952125	0.925996
EXR	35.201	35.345	-0.08598	2.177552	0.588321
FAID	1147.1	777.5	1.976654	6.880547	25.57274
FER	1929.776	2075.357	-0.05529	1.606211	1.62906
FGDP	9812.785	9906.385	0.161409	1.803702	1.279451
IAGRG	26075.35	27908	-0.20927	1.831089	1.284599
IMANG	9338.85	6314	1.477647	4.91055	10.31997
ISERG	46912.55	49292.5	0.062745	1.471502	1.960046
LAND	32318.8	33871.5	-4.03060	17.53933	230.3125
NFAID	6271.3	6168.5	0.436955	2.049807	1.388822
NSIT	43974.6	41595.5	0.3128	2.182834	0.882613
OIL	670.1657	658.6115	1.835391	7.910074	31.31956

PM	92.38968	93.28386	0.110571	2.422715	0.318468
PMC	96.14524	95.29772	0.095097	2.252839	0.495352
PMF	90.31629	89.10296	0.673236	3.944576	2.254342
PMK	567.8325	598.4	-0.00903	2.291714	0.418329
PMR	87.951	93.725	-0.24511	1.534289	1.99052
PXFF	3.27	2.945	0.633652	2.078671	2.045757
PXJ	57.025	58.51	-0.08996	3.478797	0.218013
PXJM	97.3	101.1074	-0.48378	4.461401	2.559877
PXL	1.0565	1.07	0.051672	2.042215	0.77336
PXN	87.46274	84.4001	0.569683	2.571104	1.235089
PXRMG	2.032	1.99	0.138103	1.904525	1.06363
PXT	1.5185	1.405	1.501984	4.756955	10.09226
QUOT	28665763	29407610	0.282006	1.696863	1.596219
RAGRP	12.654	12	2.068557	7.546094	31.48557
RAIN	2395.8	2343.5	0.213857	2.373683	0.479343
RESB	167.85	127.5	1.011342	3.38691	3.534125
RMANP	13.804	14.5	-0.67742	2.06182	2.263138
RSERP	16.479	17	-1.56534	4.21698	9.401794
SSE	4100.347	3489.528	0.632912	1.957109	2.24161
T	10.5	10.5	0	1.793985	1.21206
TD	199318.8	168648	0.718471	2.555068	1.885641
TGE	133345.8	132411.5	0.332568	2.070267	1.089007
TP	695.45	750	0.006653	1.848927	1.104289
WPI	1192.05	1250.5	-0.18680	1.871452	1.177657
WPIF	40.79	38.965	0.786867	3.052506	2.066161
WPIR	40.5105	40.68	0.160899	1.831834	1.223471
XFFC	1.0005	0.98	0.25503	1.950392	1.134866
XJC	0.8005	0.93	-1.47761	3.652666	7.632731
XJMC	1.0005	0.98	0.25503	1.950392	1.134866
XLC	1.0005	0.98	0.25503	1.950392	1.134866
XNC	1.0005	0.98	0.25503	1.950392	1.134866
XRMGC	0.65	0.645	-0.2481	2.182945	0.761494
XTC	1.0005	0.98	0.25503	1.950392	1.134866

7.2 Estimation of Behavioral Equations

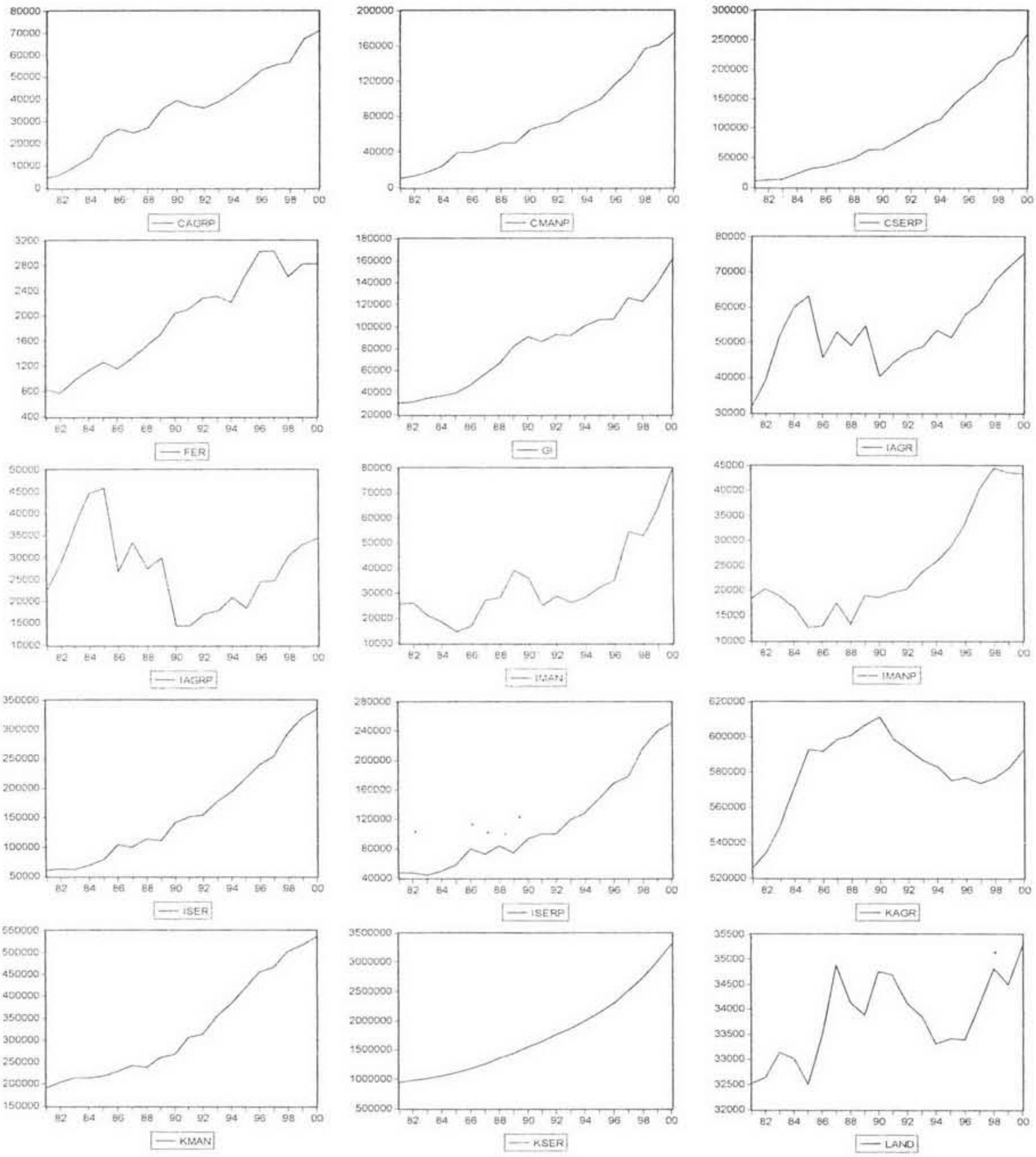
To make the model start, it is explained under research methods (in Part II) that all 28 behavioral equations have been estimated individually by selecting Two Stage Least Squares (TSLS) method with the inclusion of all exogenous and lag variables of the model as instrument lists. One question could come in this regard- why is it necessary to use TSLS method? Literally, a fundamental assumption of regression analysis is that the right-hand side variables are uncorrelated with the disturbance term. If this assumption is violated, both OLS and weighted LS are biased and inconsistent. There are a number of situations where some of the right-hand side variables are correlated with disturbances. Some classic examples occur when there are endogenously determined variables on the right-hand side of the equation, and right-hand side variables are measured with error. The standard approach in cases where right-hand side variables are correlated with the residuals is to estimate the equation using instrumental variables regression. The idea behind instrumental variables is to find a set of variables, termed instruments that are both (1) correlated with the explanatory variables in the equation, and (2) uncorrelated with the disturbances. These instruments are used to eliminate the correlation between right-hand side variables and the disturbances. Precisely, two-stage least squares (TSLS) is a special case of instrumental variables regression. As the name suggests, there are two distinct stages in two-stage least squares. In the first stage, TSLS finds the portions of the endogenous and exogenous variables that can be attributed to the instruments. This stage involves estimating an OLS regression of each variable in the model on the set of instruments. The second stage is a regression of the original equation, with all of the variables replaced by the fitted values from the first-stage regressions. The coefficients of this regression are the TSLS estimates.

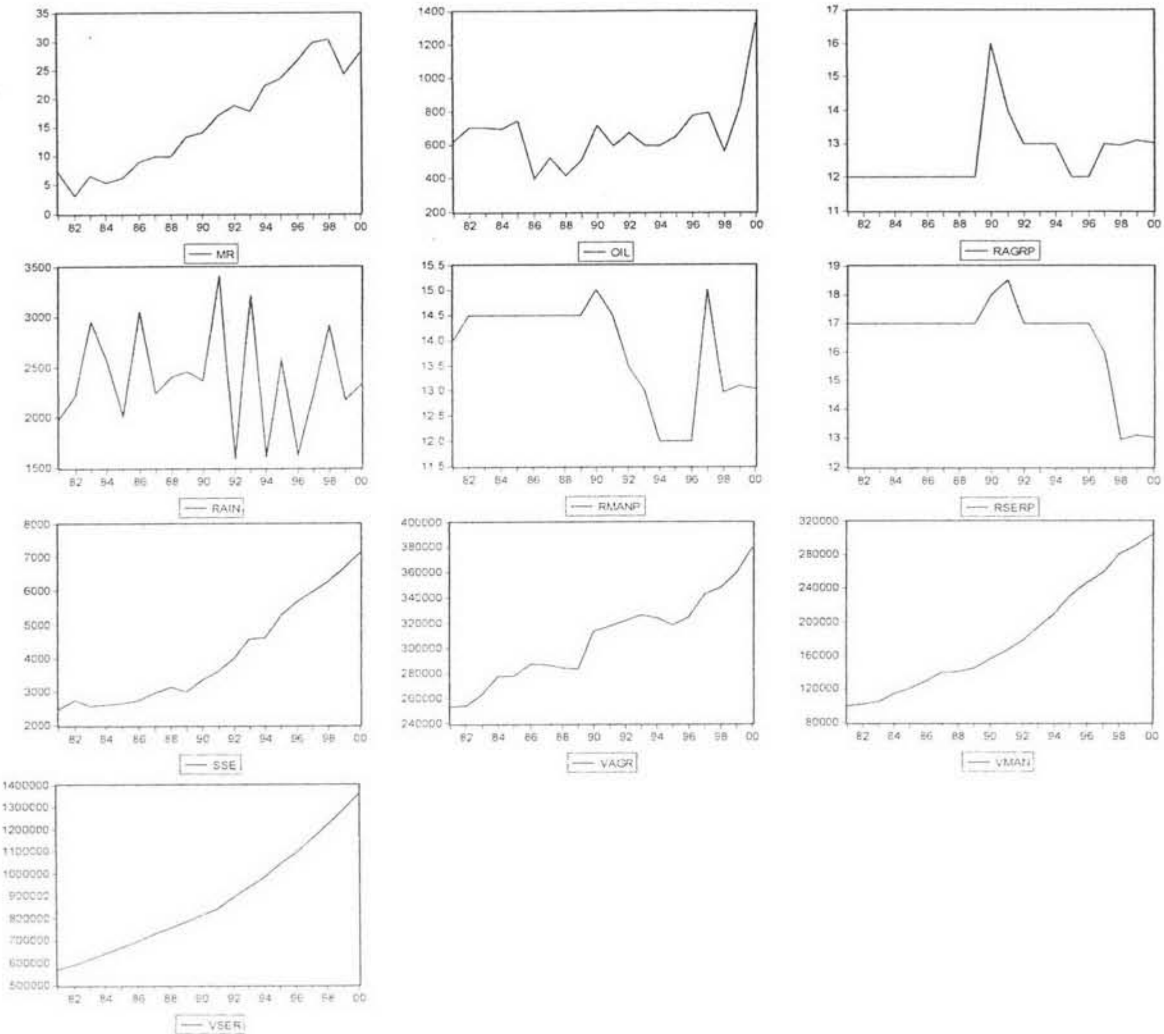
The rationale behind estimating each equation individually is to examine whether the equations can explain the behavior of the macro economy in a segregated manner. For the sake of clear understanding, all building blocks have been estimated in each equation by equation that are interpreted below.

7.2.1 Production Block

Production block can be divided into four different phases including production function, capital stock, private investment, and real credit. In each sub-blocks, there are three behavioral equations that have to be estimated. However, before estimating the equations, it is indispensable to analyze the inter-temporal trends of each indicators used in production block. Figure 7.1 depicts the pattern of time series data with respect to 25 variables that comprises production block of the model.

Figure 7.1: Inter-temporal trends of selected macroeconomic indicators under production block





It is found earlier that all of the indicators used in the model are approximate to be normally distributed. Among 25 variables used in the production block, almost all of the variables have followed upward sloping trend except 7 indicators including real private investment in agriculture (IAGRP), total arable land (LAND), oil Price (OIL), rainfall index (RAIN), interest rate in agriculture (RAGRP), interest rate in manufacturing (RMANP), interest rate in services (RSERP). Based on TSLS approach, all equations in the production block have been estimated individually in 4 phases respectively. Firstly, in production function sub-block, three equations have been regressed of which all preserves higher adjusted R-squared values[26]. However, *t*-statistic values are alarmingly lower than the critical values at 5% level. Reversely, *F*-statistics are quite higher than its critical values, which prove that the independent variables as a whole can explain the change in dependent variables of the equations.

Box 7.1: Production function sub-block

VAGR = -97922.24 + 0.22*KAGR + 2219.91*MR + 7.61*FER + 5.51*LAND + 43.14*OIL + 4.99*RAIN .... (7.1)

t	= (-0.72)	(0.80)	(1.65)	(0.49)	(0.96)	(2.61)	(0.84)
p value	= (0.49)	(0.44)	(0.13)	(0.64)	(0.36)	(0.02)	(0.42)

F-statistic = 22.16 P (F-statistic) = 0.00 Adjusted R^2 = 0.88

VMAN = -182.97 + 0.55*KMAN + 78.85*MR .... (7.2)

t	= (-0.03)	(13.04)	(0.14)
p value	= (0.98)	(0.00)	(0.89)

F-statistic = 1013.55 P (F-statistic) = 0.00 Adjusted R^2 = 0.99

VSER = 297392.70 + 0.22*KSER + 49.02*SSE .... (7.3)

t	= (30.40)	(6.76)	(3.31)
p value	= (0.00)	(0.00)	(0.00)

F-statistic = 2462.65 P (F-statistic) = 0.00 Adjusted R^2 = 0.99

Secondly, private investment in agriculture, manufacturing, and service sectors have been estimated based on real credit and government investments in each sector. Adjusted R^2 values for private investment in manufacturing and service sectors are at the expected level, whereas in agriculture section it is too low that has been shown in box 7.2.

[26] The R^2, also known as coefficient of determination, indicates the percentage of the variation in dependent variable can be explained by the explanatory variables in the model. Moreover, adjusted R^2 is used as a more desirable goodness-of-fit statistic than the R^2.

Box 7.2: Private investment in Production block

IAGRP = 85963.16 + 0.51*CAGRP - 4192.37*RAGRP - 0.28*GI .... (7.4)

t	= (3.29)	(0.85)	(1.92)	(0.99)	
p value	= (0.00)	(0.40)	(0.07)	(0.34)	
F-statistic	= 2.75	P (F-statistic)	= 0.08	Adjusted R^2	= 0.37

IMANP = 2945.25 + 0.30*CMANP + 472.62*RMANP - 0.10*GI .... (7.5)

t	= (0.21)	(4.79)	(0.50)	(1.28)	
p value	= (0.84)	(0.00)	(0.63)	(0.22)	
F-statistic	= 55.39	P (F-statistic)	= 0.00	Adjusted R^2	= 0.92

ISERP = 89211.48 + 0.78*CSERP - 3068.07*RSERP + 0.02*GI .... (7.6)

t	= (2.16)	(5.55)	(1.22)	(0.06)	
p value	= (0.05)	(0.00)	(0.24)	(0.95)	
F-statistic	= 331.20	P (F-statistic)	= 0.00	Adjusted R2	= 0.98

In the last phase of production function, real credits in agriculture, manufacture, and services sectors have been explained by interest rates. From the estimation output, it has been analyzed that real credits in agriculture and manufacturing could not be explained by only rate of interests, as the associated r^2 is extremely lower[27]. However, for real credit in service sector, the adjusted r^2 value is 0.61 meaning that 61% of the total variation in real credit can be explained by the concerning explanatory variable, i.e. rate of interest in services.

Box 7.3: Real credit in Production block

CAGRP = -27526.14 - 5240.90*RAGRP .... (7.7)

t	= (-0.54)	(1.32)			
p value	= (0.60)	(0.21)			
F-statistic	= 1.73	P (F-statistic)	= 0.21	Adjusted r^2	= 0.04

CMANP = 435247.64 - 25628.32*RMANP .... (7.8)

t	= (3.33)	(-2.71)			
p value	= (0.00)	(0.02)			
F-statistic	= 7.34	P (F-statistic)	= 0.02	Adjusted r^2	= 0.27

CSERP = 708057.75 - 36738.67*RSERP .... (7.9)

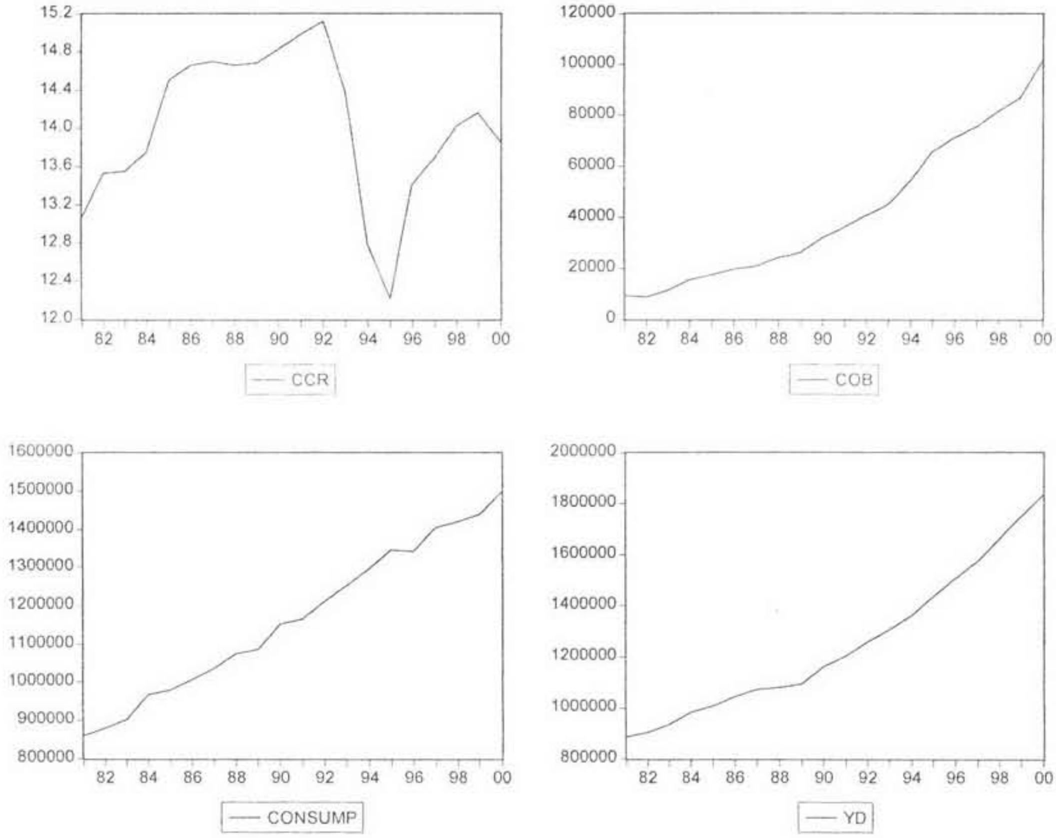
t	= (6.13)	(-5.25)			
p value	= (0.00)	(0.00)			
F-statistic	= 27.55	P (F-statistic)	= 0.00	Adjusted r^2	= 0.61

[27] For simple regression model, r^2 is used for denoting coefficient of determination, whereas R^2 is used for multiple regression model.

7.2.2 Expenditure Block

In expenditure block, 4 variables have been added including consumption, disposable income, consumer credit rate, and currencies outside banks. By plotting time series data for all 4 indicators in figure 7.2, it is envisaged that consumption, disposable income, and currencies outside banks have followed upward sloping trend at different ratios. On the contrary, consumer credit rate has not following any specific trend, i.e. irregular ups and downs with respect to time.

Figure 7.2: Inter-temporal trends of selected macroeconomic indicators under expenditure block



Based on TSLS technique, consumption function for the model has been estimated that has given very persuasive statistically significant adjusted R-squared value. Though t-statistics for each indicator are less than the critical values, the F-statistic calculated value is higher than the critical level. Hence, the consumption function as a whole can explain the behavior of expenditure on the economy.

Box 7.4: Expenditure block: A consumption function

CONSUMP = 216700.40 + 0.02*YD + 0.83*CONSUMP(-1) - 1598.22*CCR + 1.28*COB (7.10)

t	= (0.95)	(-0.05)	(5.67)	(-0.14)	(0.35)
p value	= (0.36)	(0.96)	(0.00)	(0.89)	(0.73)

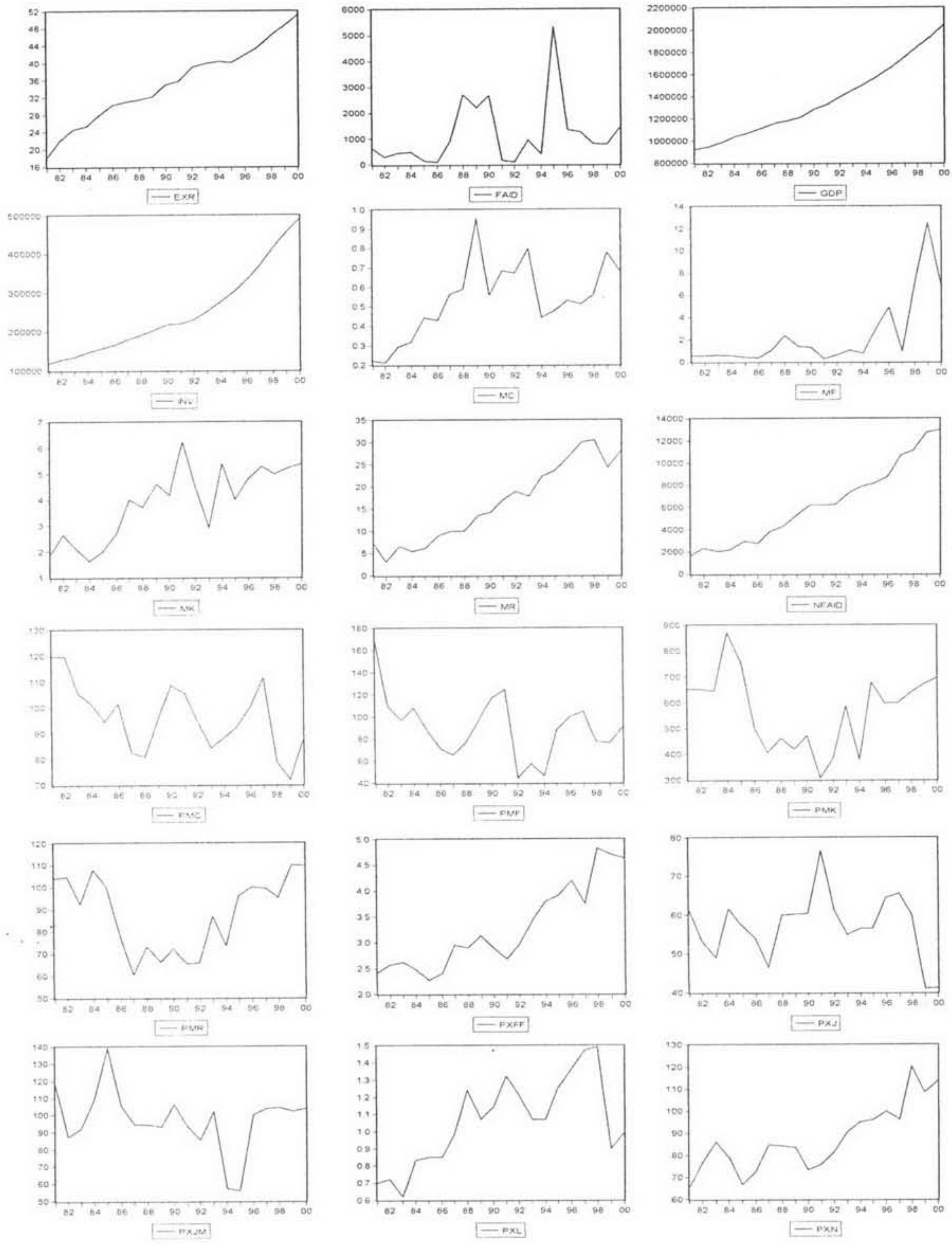
F-statistic = 268.80 P (F-statistic) = 0.00 Adjusted R^2 = 0.98

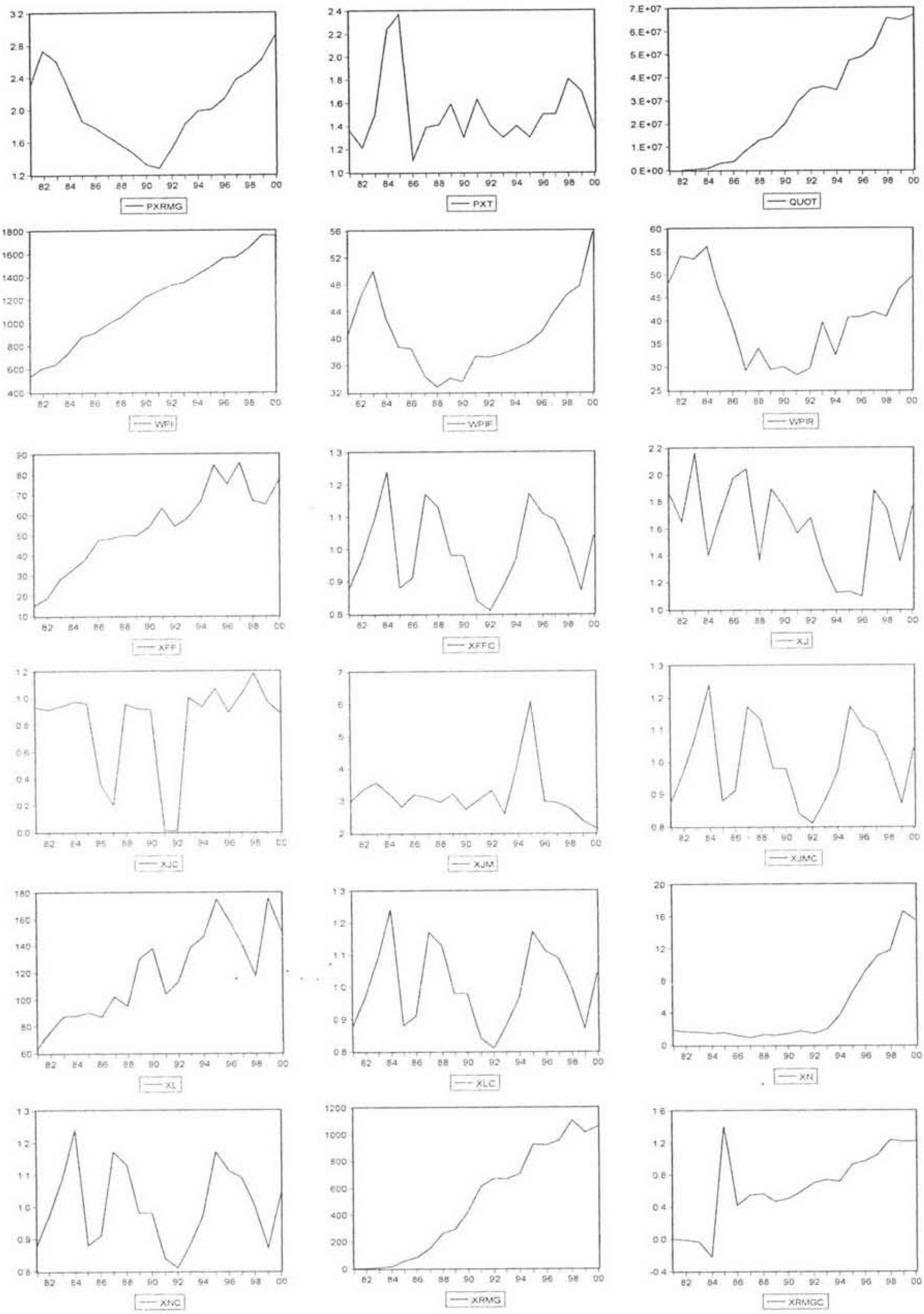
7.2.3 Balance of Payments Block

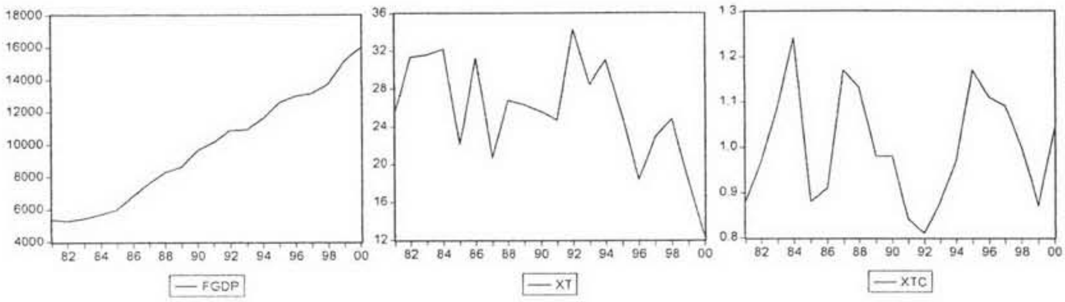
As the biggest block of the model, balance of payments block has comprised of 39 variables of which 11 are endogenous and 28 exogenous determined outside the model. Basically, this block has made the link between domestic economy and external economies incorporating international trade effects in the macroeconometric model used in the thesis.

After plotting all data series in a two dimensional plain depicting in Figure 7.3, it has been found that 9 variables have been running in upward sloping trends including: exchange rate, real GDP, investment, import of intermediates and raw materials, real non-food aid, quota for the ready-made garments industry, wholesale price index, export value for non-traditional goods and services, and export values for ready-made garments. Beyond these variables, 29 indicators have been following zigzag paths that have no specific trends. One of the main problems with no-trend data series is that it cannot identify any correlation with rest of the variables in lining with respect to time. As the fundamental logic of making this macro model is to explain the economy depending on theories firstly and testified with empirical evidences later, it is determined to stick with the initial restructured macro model without including any interventions based on statistical results.

Figure 7.3: Inter-temporal trends of selected macroeconomic indicators under balance of payments block




PXRMG
PXT
QUOT
WPI
WPIF
WPIR
XFF
XFFC
XJ
XJC
XJM
XJMC
XL
XLC
XN
XNC
XRMG
XRMGC



As most of the variables have not associated with any specific trends, it is too hard to estimate with TSLS approach. However, it is decided earlier that the macroeconometric model has been structured in line with conventional theories rather than depending on empirical statistical estimations. Therefore, both export supply and import demand functions have been estimated with the original data series that have been presented in box 7.5 and box 7.6. In case of export supply functions, 7 equations have been estimated to explain the behavior of aggregate exports of Bangladesh economy. Due to the lack of trends in individual data series, it has been uncovered that most of the adjusted R^2 values came up with statistically insignificant values that prohibit export supply functions into considerations. However, there is only one exception in regard to export values for ready-made garments depicting in equation 7.13. This functional relationship has achieved the highest adjusted R-squared value that is verified with the condition of *t*-statistic and *F*-statistic along with its probability values.

Box 7.5: Export Supply Functions: Balance of payments block

XJ = 2.86 - 0.33*((PXJ*EXR)/WPI) + 0.22*XJC + 0.05*(FGDP/1000)........................... (7.11)

t	= (3.13)	(0.86)	(1.00)	(1.64)	
p value	= (0.00)	(0.41)	(0.33)	(0.12)	
F-statistic = 1.40		P (F-statistic) = 0.28		Adjusted R^2 = 0.23	

XJM = 6.48 - 1.10*((PXJM*EXR)/WPI) + 1.32*XJMC + 0.14*(FGDP/1000) .... (7.12)

t	= (3.68)	(4.37)	(1.18)	(2.69)	
p value	= (0.00)	(0.00)	(0.26)	(0.02)	
F-statistic = 7.77		P (F-statistic) = 0.00		Adjusted R^2 = 0.62	

XRMG = 281.04 - 2771.09*((PXRMG*EXR)/WPI) + 53.03*XRMGC + 0.02*(QUOT/1000) - 9.65*(FGDP/1000) .... (7.13)

t	= (1.60)	(3.33)	(1.32)	(5.54)	(0.41)
p value	= (0.13)	(0.01)	(0.21)	(0.00)	(1.69)
F-statistic = 270.98		P (F-statistic) = 0.00		Adjusted R^2 = 0.99	

XFF = -3.69 - 487.11*((PXFF*EXR)/WPI) + 37.19*XFFC + 7.02*(FGDP/1000) .... (7.14)

t	= (0.29)	(3.69)	(3.08)	(8.88)	
p value	= (0.78)	(0.00)	(0.01)	(0.00)	
F-statistic = 41.96		P (F-statistic) = 0.00		Adjusted R^2 = 0.90	

XT = 51.69 - 107.21*((PXT*EXR)/WPI) + 8.25*XTC + 1.27*(FGDP/1000) .... (7.15)

t	= (4.05)	(0.93)	(0.89)	(2.97)	
p value	= (0.00)	(0.37)	(0.39)	(0.01)	
F-statistic = 3.21		P (F-statistic) = 0.06		Adjusted R^2 = 0.41	

XL = 50.20 - 1457.62*((PXL*EXR)/WPI) + 30.99*XLC + 8.71*(FGDP/1000) .... (7.16)

t	= (1.25)	(1.74)	(0.97)	(6.47)	
p value	= (0.23)	(0.10)	(0.35)	(0.00)	
F-statistic = 14.23		P (F-statistic) = 0.00		Adjusted R^2 = 0.75	

XN = -21.05 - 4.43*((PXN*EXR)/WPI) + 1.91*XNC + 1.20*(FGDP/1000) .... (7.17)

t	= (3.67)	(2.37)	(0.37)	(5.63)	
p value	= (0.00)	(0.03)	(0.72)	(0.00)	
F-statistic = 21.96		P (F-statistic) = 0.00		Adjusted R^2 = 0.82	

Likewise, import demand sub-block under balance of payments block has been incorporated with 4 equations that attempted to explain the aggregate imports behavior of the economy. In this sub-block, 16 variables have been gathered of which 12 are exogenously determined. Equations for import of intermediates and raw materials (MR) and import of capital goods (MK) have experienced with statistically significant adjusted R-squared values that is demonstrated in equations 7.19 and 7.20 respectively. However, functional equations for import of food grains (MF) and import of consumer goods (MC) have unexpectedly lower R^2 followed by lower calculated *t*-statistics and *F*-statistic along with the concerning p values.

Box 7.6: Import Demand Functions: Balance of payments block

MF = -5.74 - 0.06*((PMF*EXR)/WPIF) - 0.22*(FAID/1000) + 0.93*(GDP/100000) ...... (7.18)

t	= (1.52)	(0.89)	(0.46)	(3.67)	
p value	= (0.15)	(0.39)	(0.65)	(0.00)	
F-statistic	= 6.98	P (F-statistic) = 0.00		Adjusted R^2 = 0.60	

MR = -15.57 + 0.23*((PMR*EXR)/WPIR) + 1.01*(GDP/100000) .... (7.19)

t	= (-5.17)	(2.05)	(1.36)	
p value	= (0.00)	(0.06)	(0.19)	
F-statistic	= 83.97	P (F-statistic) = 0.00		Adjusted R^2 = 0.92

MK = 7.49 - 0.16*((PMK*EXR)/WPI) + 0.20*(NFAID/1000) + 0.01*(INV/1000) - 0.37*(GDP/100000) .... (7.20)

t	= (2.65)	(5.34)	(0.65)	(1.25)	(0.97)
p value	= (0.02)	(0.00)	(0.53)	(0.23)	(0.35)
F-statistic	= 26.83	P (F-statistic) = 0.00		Adjusted R^2 = 0.89	

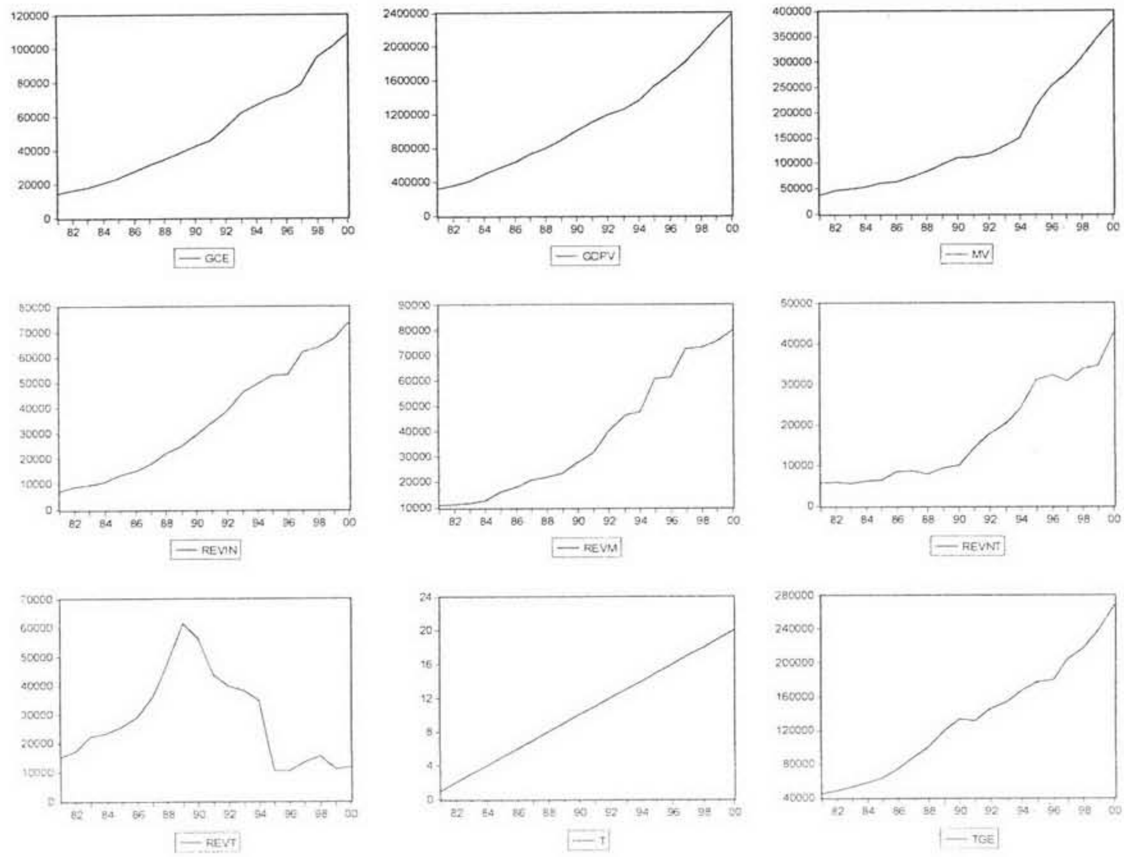
MC = 1.24 - 0.22*((PMC*EXR)/WPI) - 0.00347*(GDP/100000) .... (7.21)

t	= (2.88)	(2.32)	(0.24)	
p value	= (0.01)	(0.03)	(0.81)	
F-statistic	= 4.17	P (F-statistic) = 0.04		Adjusted R^2 = 0.36

7.2.4 Government Block

In government block, there are 9 variables of which 5 are endogenously determined by the model. It is very effective for building a model to observe that, out of 9, 8 indicators have experienced with upward sloping curves meaning that all are positively related with each other by convention. However, revenue from other trade related taxes (REVT) has increased up to the year 1989 and simultaneously decreased thereafter. These all macroeconomic indicators related to government block have been traced out in Figure 7.4 with respect to the same timeline.

Figure 7.4: Inter-temporal trends of selected macroeconomic indicators under government block



Government block has been divided into two facets- government revenue and government expenditures sectors. In these two sub-blocks, there are 5 equations of which 4 equations has incorporated with government revenue sector. In this regard, it has been observed that revenue functions for import duties, internal taxes, and non-tax sources have verified with high adjusted R-squared values; whereas only one function i.e. revenue function for other trade related taxes has attached with relatively lower Adjusted R-squared value that forbids to establish a relationship between total imports volume and revenue from other trade related taxes. However, from the viewpoint of *F*-statistics consideration with its *p* values, all 4 equations in government revenue sector of the model have preserved higher calculated values than the critical level that is statistically significant enough to reject the null hypothesis.

Box 7.7: Government Revenue Sector: Government block

REVM = 6809.396 + 0.21*MV .... (7.22)

t	= (2.55)	(15.42)		
p value	= (0.02)	(0.00)		
F-statistic	= 237.67	P (F-statistic) = 0.00	Adjusted R^2 = 0.93	

REVT = 44712.76 + 0.10*MV .... (7.23)

t	= (8.05)	(-3.28)		
p value	= (0.00)	(0.00)		
F-statistic	= 10.77	P (F-statistic) = 0.00	Adjusted R^2 = 0.36	

REVIN = -5383.87 + 0.04*GDPV + 43.64*(((REVIN(-1)-REVIN(-2))/REVIN(-2))*100) ... (7.24)

t	= (-1.31)	(18.66)	(0.27)	
p value	= (0.21)	(0.00)	(0.79)	
F-statistic	= 272.33	P (F-statistic) = 0.00	Adjusted R^2 = 0.97	

REVNT = -5528.95 + 0.02*GDPV + 31.65*(((REVNT(-1)-REVNT(-2))/REVNT(-2))*100).. (7.25)

t	= (-3.23)	(16.51)	(0.64)	
p value	= (0.01)	(0.00)	(0.53)	
F-statistic	= 136.80	P (F-statistic) = 0.00	Adjusted R^2 = 0.94	

In government expenditure sector under government block, it is uncovered that time lag has made a significant difference in total government consumption expenditures. Though t-statistic consideration has not given positive indication to verify the 'government consumption expenditure function', calculated F-statistic has proved the validity of higher adjusted R-squared value.

Box 7.8: Government Expenditure Sector: Government block

GCE = -1115.73 + 0.02*GDPV + 0.46*GCE(-1) - 0.007*TGE + 352.41*T .... (7.26)

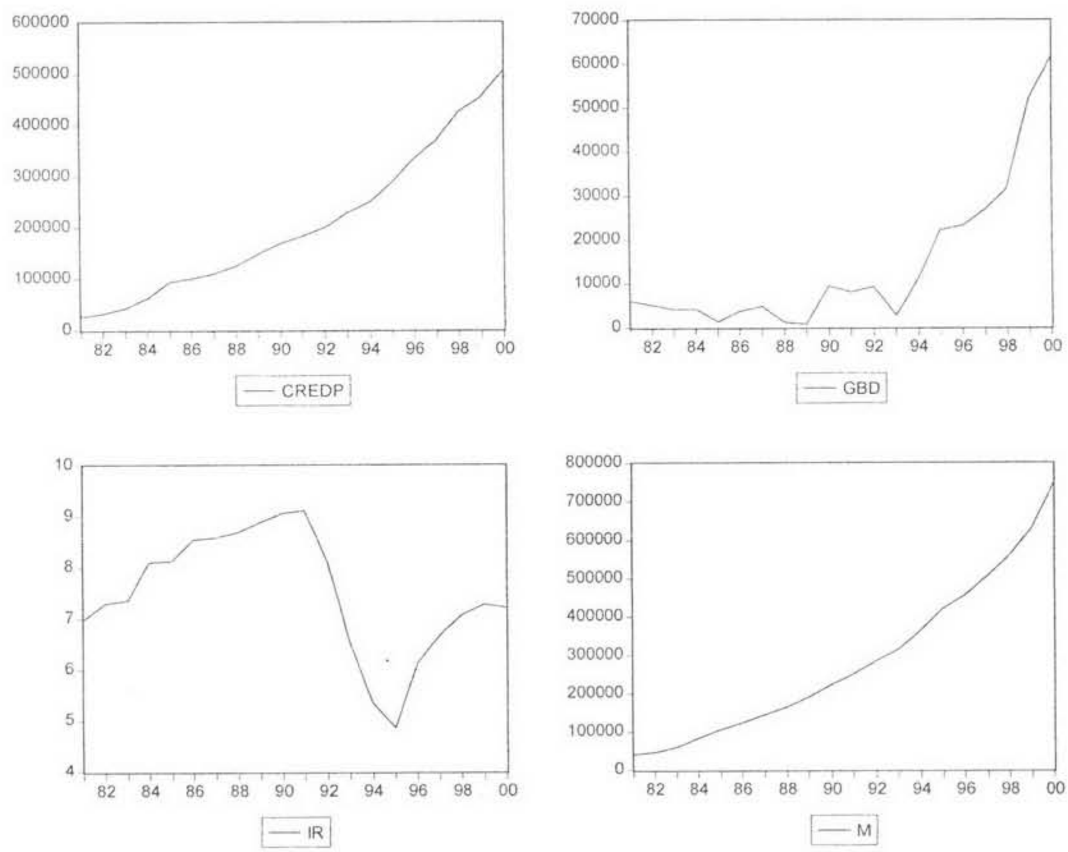
t	= (-0.55)	(1.93)	(1.96)	(-0.07)	(0.42)
p value	= (0.59)	(0.08)	(0.07)	(0.94)	(0.68)
F-statistic	= 527.63	P (F-statistic) = 0.00	Adjusted R^2 = 0.99		

7.2.5 Monetary Block

It is to be recapitulated that monetary block has comprised of 4 variables including money supply (M), nominal credit to the private sector (CREDP), government budget deficit (GBD), and rate of interest (IR). However, in this money supply equation, there is only 1 exogenous variable, which is also the monetary policy instrument to the model, i.e. interest rate.

By putting the time-series data, it has been seen that an upward sloping trend has been followed by CREDP. On the contrary, just after 1993, government budget deficit has been increasing dramatically due to expansionary fiscal policy made by the then governments. Interest rate has not maintained any trends due to having 2 major structural changes on the economy. Finally, money supply has been increasing increasingly that followed approximately an exponential path.

Figure 7.5: Inter-temporal trends of selected macroeconomic indicators under monetary block



After estimating money supply equation, it has visualized that interest rate has dominated total money supply of the economy. The estimated procedure has also passed all general statistical tests vis-à-vis individual t-statistic, F-statistic and its p values. Box 7.9 has given a specific explanation about the money block estimation.

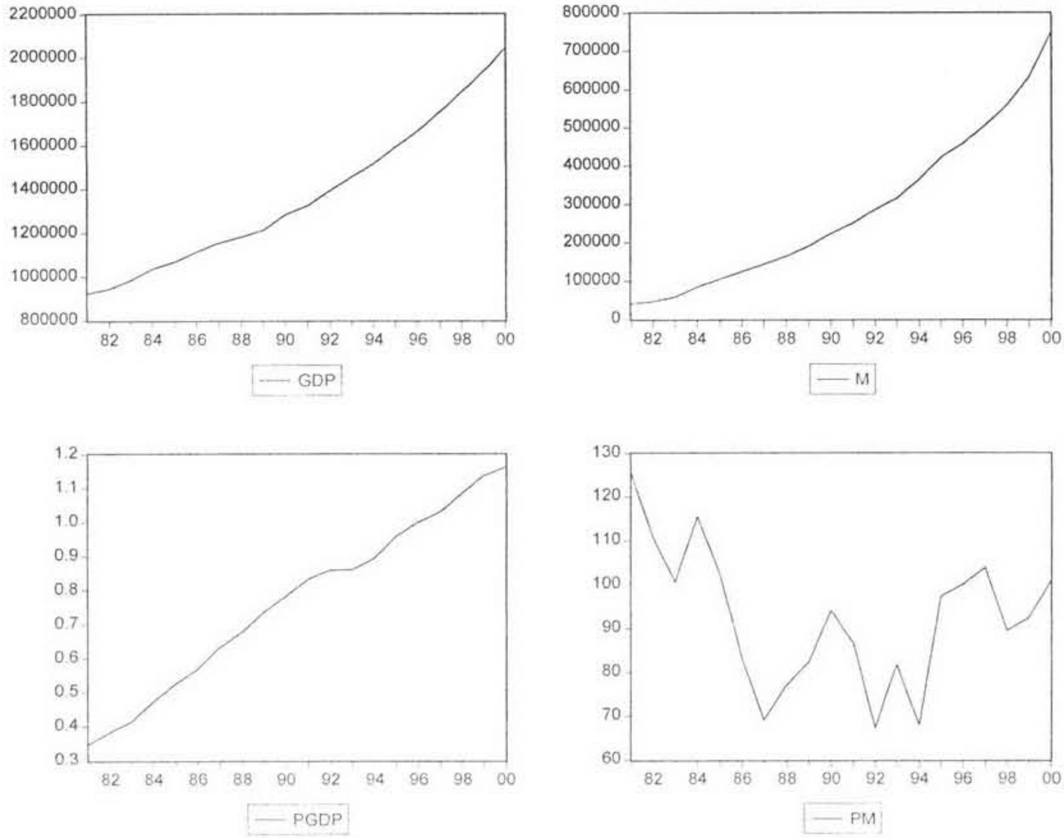
Box 7.9: Money Supply Function: Monetary block

M =	**59020.79 + 1.27*CREDP + 1.21*GBD - 6863.06*IR**					.... (7.27)
t	= (1.90)	(18.06)	(2.34)	(-2.06)		
p value	= (0.08)	(0.00)	(0.03)	(0.06)		
F-statistic	= 1089.55	P (F-statistic) = 0.00			Adjusted R^2 = 0.99	

7.2.6 Price Block

As one of the smallest blocks of the model, price block has comprised of only 1 behavioral equation of which there are 3 endogenous and 1 exogenous variable. After plotting all data series in a two-dimensional plain depicting in Figure 7.6, it has been found that GDP, GDP deflator, and money supply have experienced with the same upward shapes in time-series trends. Furthermore, both GDP and money supply have seemed to have exponential growths with respect to time. Price of imports (PM) under price block has been following zigzag paths that have no specific trends in lining with the dependent variable, i.e. money supply.

Figure 7.6: Inter-temporal trends of selected macroeconomic indicators under price block



After estimating GDP deflator function, it has been explored that GDP deflator has been influenced dominantly by its own lag-value. This relation has also been testified by F-statistic and its associated p value. It is to be mentioned that the coefficient values in equation 7.28 are tends to in decimal numbers due to the scaling factor of the variables. Since E-views considers more than 17 decimal numbers, the scaling error cannot influence the whole model.

Box 7.10: Price Index: Price block

PGDP = 0.001508 - 0.000627*(M/10000) + 0.000690*(GDP/10000) + 0.104255*(PM/1000) + 0.940450*PGDP(-1) .... (7.28)

t	= (0.00)	(-0.20)	(0.29)	(0.29)	(9.13)
p value	= (0.99)	(0.85)	(0.78)	(0.79)	(0.00)

F-statistic = 740.04 P (F-statistic) = 0.00 Adjusted R^2 = 0.99