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# APPENDICES

# APPENDIX A

## Investment, Saving and Portfolio Balance Equations

In this appendix, I will show other equations that are used to derive non-tradable relative price model and real exchange rate model.

### Investment function

The investment function and intertemporal optimization follow the logic of suboptimal feedback control using dynamic programming. The conclusion is that the rate of change in the capital intensity should be positively related to the current Keynes-Tobin q ratio: the capital value of an asset relative to its supply price. Investment (A.2) is positively related to q. When q =1, the capital intensity is kept constant.

Capital is used to produce export good 1 and the non-traded good; and the capital good consists of both imported good 2 and non-traded good n. Capital is allocated between the tradable and non-tradable sectors equal the rents per unit of capital. The common value of the marginal physical product of capital ( measured in terms good 1) in the two sectors is f'( k; $R_n$, y ), where vector y = ($y_t$, $y_n$ ) is a parameter of the marginal product function.

The investment good is a composition of import good 2 and non-traded good n in form $dk = I_2^{m} I_n^{(1-m)}$. The price of the capital good is $p_k = p_2^{m} p_n^{(1-m)}$. Fraction m of the supply price of a capital good consists of imported good 2 and fraction (1 - m) of the non-traded good. The relative price $p = p_I/p_k = T^{m} / R_n^{(1-m)}$

is a function of the relative price of non- tradable $R_n = p_n/p_I$ and the terms of trade T. The q ratio ( see A.3) is the expected value of the ratio of the stream of returns relative to the supply price. The terms of trade T and the vector of productivity y = ( $y_t$, $y_n$ ) increases investment, the real rate of interest decreases investment. The relative price of non-tradable has an ambiguous effect. A rise in $R_n$ stimulates investment in non-tradable, since only a fraction of the capital goods is imported. The rise in $R_n$ discourages investment in the export sector. It is expected that $R_n$ has a negligible effect upon investment but its main effect is that it allocates capital between the two sectors.

The investment equation ( see A.2) is base on the logic of the suboptimal feedback control in an open economy with financial assets. Since Thailand is a small country, T is exogenous.

$$dk/dt = I = I(q);\ I(1) = 0,\ I'>0 \qquad (A.1)$$

$$q = E\int pf'(k;y)\exp(-rt)dt = [T^m/(R_n)^{1-m}]f'(k;y)/r$$

$$= q(k, T, R_n, y, r) \qquad (A.2)$$

## Saving function

The consumption (saving) is social: public plus private. This means that it does not make any assumption about Ricardian equivalence. The social consumption function is base on Merton's model which is an intertemporal stochastic optimizing using dynamic programming. Consumption is proportional

to current wealth. Using a Bernoulli utility function, the factor of proportionality is the rate of time preference, which is the discount rate. The consumption function can be written as C = C(k-F; 1-s), C'>0. Social consumption depends on wealth, capital less foreign debt, and is parameterized by a measure of social thrift s which is an inverse measurement of the social discount rate.

NATREX does not require that a country has to have an 'intertemporal budget constraint' where the initial and terminal values of the debt are equal, or that the terminal debt is zero. NATREX permits a country to change from a debtor to a creditor and vice versa. Instead, NATREX require that the equilibrium value of the debt must be a dynamically stable endogenous variable, which is a function of the fundamentals Z. A rise in debt lowers wealth and consumption. Saving is defined as GDP less consumption, $S = Y( k; y ) - r'F - C( k-f; 1-s) = S( k, F; Z )$. A rise in debt will lower wealth and increase saving $S_F > 0$. A rise in capital will rise saving for low values of capital ( where Y' is high) and lower it for low values of capital ( where Y' is low). In this thesis, I will refer s =S/GDP as a mesurement of social thrift. Thus a general saving function ( see A.3) is as the above, where all derivatives are positive, except $S_k$ of high value of capital. The parameters in Z are productivity, terms of trade, the real foreign interest rate, and social thrift.

$$S = Y( k; y ) - r'F - C( k-F; 1-s) = S( k, F; Z ) \qquad (A.3)$$

Portfolio balance equation

$$r = r' + h( F, t ) \qquad (A.4)$$

Portfolio balance and real long term interest have some assumptions as follows.:

(1) the uncovered interest-rate parity hypothesis is not valid. This means that nominal (real) short-term interest rate differentials are not a predictor of changes in nominal (real) exchange rates.

(2) the real long-term interest rate differential of Thailand less US ten- year bonds is stationary. Therefore, in investment function, we can substitute domestic interest rate by foreign interest rate.

# APPENDIX B

## The Estimation of Quarterly Real Gross Domestic Product

Quarterly real gross domestic product(RGDP) is generated on the basis of its annual data and other related variables by using these following steps

1. find out the variables determining real gross domestic product whose quarterly data can be observable. In this thesis real government expenditure (RGE) and real export value (RXP) are introduced.

2 regress the following equation:

$$RGDP_t = C + a\,RGE_t + bRXPt + u_t$$

3.generate the quarterly RGDP(QRGDP) by using the quarterly data of RGE and RXP

$$QRGDP = (C/4) + aQRGE_t + bQRXP_t + u_t$$

4. add up the generated QRGDP in order to obtain generated annual RGDP, and then get its residuals as follows:

$$RES_t = RGDP_t - \Sigma QRGDP_{it}$$

5. obtain the weight quarterly residual (WRES) by the following equation

$$WRES = (QRGDP/QRGDP)*RES$$

6. compute the estimated quarterly RGDP as follows:

$$y = QRGDP + WRES$$

# APPENDIX C

## The approximation of quarterly saving

Since in these thesis, we need to use the quarterly saving data to proxy the thrift of country, but the data have collected in annually series. There are many ways to estimate, but in this thesis l use following 8 steps.

1. since we have private investment index (PII) that are collected in monthly.

2. sum PII to each quatertters.

3. sum PII in each years.

4. derive weight PII in each quitters by (1) devide (2).

5. multiply (3) in each year of investment.

6. sum proxies of quarterly investment to each year and device proxies annually investment by actual investment, the results are weighted annually investment.

7. multiplyUse the weighted annually by the approximate quarterly investment.

8. find out approximation of quarterly gross saving by minus approximate quarterly investment be actual quarterly current account or (S = I - CA).

# APPENDIX D

## Results Co-integration, Error-Correction of Rn

Sample: 1980:1 1997:4
Included observations: 64
Test assumption: No deterministic trend in the data
Series: NTREX GDPDLABOR RSGDP88 TOT RINTUS1
Lags interval: 1 to 7

| Eigenvalue | Likelihood Ratio | 5 Percent Critical Value | 1 Percent Critical Value | Hypothesized No. of CE(s) |
|---|---|---|---|---|
| 0.527588 | 122.0949 | 76.07 | 84.45 | None ** |
| 0.401849 | 74.10106 | 53.12 | 60.16 | At most 1 ** |
| 0.271854 | 41.21065 | 34.91 | 41.07 | At most 2 ** |
| 0.214516 | 20.90643 | 19.96 | 24.60 | At most 3 * |
| 0.081678 | 5.453276 | 9.24 | 12.97 | At most 4 |

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 4 cointegrating equation(s) at 5% significance level

Unnormalized Cointegrating Coefficients:

| NTREX | GDPDLABOR | RSGDP88 | TOT | RINTUS1 | C |
|---|---|---|---|---|---|
| -72.63269 | 0.207247 | -5.533939 | -7.860721 | -16.79788 | 12.60414 |
| 132.8300 | -1.316049 | 1.969302 | 8.621085 | -15.52595 | -13.13166 |
| -4.096413 | -0.641181 | -2.068784 | 2.421402 | 14.93783 | -1.439073 |
| 159.6787 | -1.823671 | 4.975054 | 14.44801 | 5.574638 | -21.52144 |
| -48.20213 | 2.904567 | -9.464743 | -1.254199 | -1.982682 | 4.446573 |

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

| NTREX | GDPDLABOR | RSGDP88 | TOT | RINTUS1 | C |
|---|---|---|---|---|---|
| 1.000000 | -0.002853 | 0.076191 | 0.108226 | 0.231272 | -0.173533 |
| | (0.00542) | (0.02038) | (0.01336) | (0.09603) | (0.02048) |
| Log likelihood | 1113.366 | | | | |

Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)

| NTREX | GDPDLABOR | RSGDP88 | TOT | RINTUS1 | C |
|---|---|---|---|---|---|
| 1.000000 | 0.000000 | 0.101012 | 0.125749 | 0.372094 | -0.203736 |
| | | (0.07235) | (0.03824) | (0.33208) | (0.06747) |
| 0.000000 | 1.000000 | 8.698815 | 6.141193 | 49.35316 | -10.58513 |
| | | (8.75607) | (4.62795) | (40.1891) | (8.16570) |
| Log likelihood | 1129.811 | | | | |

Normalized Cointegrating Coefficients: 3 Cointegrating Equation(s)

| NTREX | GDPDLABOR | RSGDP88 | TOT | RINTUS1 | C |
|---|---|---|---|---|---|
| 1.000000 | 0.000000 | 0.000000 | -0.051272 | -0.866729 | 0.029592 |
| | | | (0.23864) | (1.46952) | (0.26518) |
| 0.000000 | 1.000000 | 0.000000 | -9.103320 | -57.33055 | 9.508316 |
| | | | (18.8619) | (116.149) | (20.9599) |
| 0.000000 | 0.000000 | 1.000000 | 1.752482 | 12.26417 | -2.309907 |
| | | | (2.82899) | (17.4206) | (3.14366) |
| Log likelihood | 1139.963 | | | | |

Normalized Cointegrating Coefficients: 4 Cointegrating Equation(s)

| NTREX | GDPDLABOR | RSGDP88 | TOT | RINTUS1 | C |
|---|---|---|---|---|---|
| 1.000000 | 0.000000 | 0.000000 | 0.000000 | -0.454379 | -0.019777 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | (0.48090) | (0.03686) |
| 0.000000 | 1.000000 | 0.000000 | 0.000000 | 15.88171 | 0.742950 |
| | | | | (80.1130) | (6.14061) |
| 0.000000 | 0.000000 | 1.000000 | 0.000000 | -1.829937 | -0.622485 |
| | | | | (16.6585) | (1.27686) |
| 0.000000 | 0.000000 | 0.000000 | 1.000000 | 8.042369 | -0.962876 |
| | | | | (10.9645) | (0.84042) |
| Log likelihood | 1147.690 | | | | |

Sample(adjusted): 1982:1 1997:4
Included observations: 64 after adjusting endpoints
Standard errors & t-statistics in parentheses

| Cointegrating Eq: | CointEq1 |
|---|---|
| NTREX(-1) | 1.000000 |
| GDPDLABOR(-1) | -0.002853 |
| | (0.00542) |
| | (-0.52655) |
| RSGDP88(-1) | 0.076191 |
| | (0.02038) |
| | (3.73806) |
| TOT(-1) | 0.108226 |
| | (0.01336) |
| | (8.09950) |
| RINTUS1(-1) | 0.231272 |
| | (0.09603) |
| | (2.40835) |
| C | -0.173533 |
| | (0.02048) |
| | (-8.47314) |

| Error Correction: | D(NTREX) | D(GDPDLABOR) | D(RSGDP88) | D(TOT) | D(RINTUS1) |
|---|---|---|---|---|---|
| CointEq1 | -0.567225 | -6.469060 | -0.758068 | 1.058304 | -0.724297 |
| | (0.14641) | (2.48213) | (2.68578) | (1.82940) | (0.52698) |
| | (-3.87434) | (-2.60625) | (-0.28225) | (0.57850) | (-1.37443) |
| D(NTREX(-1)) | 0.082147 | 8.651681 | 3.516745 | 3.013595 | 1.140100 |
| | (0.25508) | (4.32463) | (4.67945) | (3.18737) | (0.91816) |
| | (0.32204) | (2.00056) | (0.75153) | (0.94548) | (1.24173) |
| D(NTREX(-2)) | 0.250888 | 7.055611 | -3.963709 | 3.341005 | 0.444265 |
| | (0.36885) | (6.25344) | (6.76650) | (4.60896) | (1.32766) |
| | (0.68019) | (1.12828) | (-0.58578) | (0.72489) | (0.33462) |
| D(NTREX(-3)) | 0.070332 | 7.310856 | -3.463999 | 3.142616 | 1.023313 |
| | (0.30091) | (5.10152) | (5.52008) | (3.75996) | (1.08310) |
| | (0.23373) | (1.43307) | (-0.62753) | (0.83581) | (0.94480) |
| D(NTREX(-4)) | 0.443648 | -3.878991 | 0.394201 | -5.914788 | 1.276384 |
| | (0.27670) | (4.69108) | (5.07596) | (3.45745) | (0.99596) |
| | (1.60337) | (-0.82689) | (0.07766) | (-1.71074) | (1.28157) |
| D(NTREX(-5)) | 1.129429 | 4.550335 | -2.367940 | -12.90913 | 0.685697 |
| | (0.30447) | (5.16197) | (5.58549) | (3.80452) | (1.09593) |
| | (3.70946) | (0.88151) | (-0.42394) | (-3.39310) | (0.62567) |
| D(NTREX(-6)) | 0.441837 | -0.070080 | 2.111737 | -1.778540 | 0.598305 |
| | (0.34967) | (5.92816) | (6.41454) | (4.36922) | (1.25860) |
| | (1.26360) | (-0.01182) | (0.32921) | (-0.40706) | (0.47537) |
| D(NTREX(-7)) | 0.959251 | 1.868541 | -7.975567 | -9.162893 | 0.440722 |

| | | | | | |
|---|---|---|---|---|---|
| | (0.32648) | (5.53501) | (5.98913) | (4.07946) | (1.17513) |
| | (2.93819) | (0.33759) | (-1.33167) | (-2.24611) | (0.37504) |
| D(GDPDLABOR(-1)) | 0.013355 | -0.053269 | 0.058320 | 0.107462 | -0.071585 |
| | (0.01216) | (0.20610) | (0.22301) | (0.15190) | (0.04376) |
| | (1.09859) | (-0.25846) | (0.26151) | (0.70744) | (-1.63596) |
| D(GDPDLABOR(-2)) | 0.029687 | 0.117962 | 0.565848 | -0.117939 | 0.002487 |
| | (0.01444) | (0.24480) | (0.26488) | (0.18042) | (0.05197) |
| | (2.05603) | (0.48188) | (2.13624) | (-0.65369) | (0.04786) |
| D(GDPDLABOR(-3)) | 0.052846 | 0.202333 | 0.428755 | -0.398147 | -0.002851 |
| | (0.01621) | (0.27488) | (0.29743) | (0.20259) | (0.05836) |
| | (3.25937) | (0.73608) | (1.44152) | (-1.96524) | (-0.04885) |
| D(GDPDLABOR(-4)) | 0.054854 | 0.932717 | 0.199689 | -0.115845 | 0.111868 |
| | (0.01941) | (0.32900) | (0.35599) | (0.24248) | (0.06985) |
| | (2.82672) | (2.83502) | (0.56094) | (-0.47775) | (1.60156) |
| D(GDPDLABOR(-5)) | 0.076917 | 0.701825 | -0.041924 | -0.440638 | 0.134308 |
| | (0.02118) | (0.35901) | (0.38846) | (0.26460) | (0.07622) |
| | (3.63234) | (1.95491) | (-0.10792) | (-1.66531) | (1.76211) |
| D(GDPDLABOR(-6)) | 0.027172 | 0.559030 | -0.076830 | 0.110839 | 0.033300 |
| | (0.02209) | (0.37455) | (0.40528) | (0.27605) | (0.07952) |
| | (1.22992) | (1.49255) | (-0.18957) | (0.40152) | (0.41876) |
| D(GDPDLABOR(-7)) | 0.020380 | 0.887660 | -0.153375 | 0.334633 | 0.010211 |
| | (0.01816) | (0.30793) | (0.33320) | (0.22696) | (0.06538) |
| | (1.12203) | (2.88263) | (-0.46031) | (1.47444) | (0.15618) |
| D(RSGDP88(-1)) | 0.038878 | 0.536959 | -0.588460 | -0.081061 | 0.063572 |
| | (0.01498) | (0.25397) | (0.27481) | (0.18719) | (0.05392) |
| | (2.59523) | (2.11422) | (-2.14132) | (-0.43305) | (1.17899) |
| D(RSGDP88(-2)) | 0.026714 | 0.473912 | -0.677812 | -0.106234 | 0.037954 |
| | (0.01650) | (0.27970) | (0.30265) | (0.20615) | (0.05938) |
| | (1.61924) | (1.69434) | (-2.23958) | (-0.51533) | (0.63914) |
| D(RSGDP88(-3)) | 0.010322 | 0.398710 | -0.633128 | -0.078112 | 0.041380 |
| | (0.01605) | (0.27205) | (0.29438) | (0.20051) | (0.05776) |
| | (0.64323) | (1.46555) | (-2.15075) | (-0.38956) | (0.71642) |
| D(RSGDP88(-4)) | -0.016041 | 0.120413 | -0.187148 | 0.025078 | 0.074770 |
| | (0.01660) | (0.28136) | (0.30444) | (0.20737) | (0.05973) |
| | (-0.96658) | (0.42797) | (-0.61473) | (0.12093) | (1.25171) |
| D(RSGDP88(-5)) | -0.005165 | 0.145877 | -0.098718 | -0.134792 | 0.019135 |
| | (0.01593) | (0.27006) | (0.29222) | (0.19904) | (0.05734) |
| | (-0.32423) | (0.54017) | (-0.33783) | (-0.67721) | (0.33373) |
| D(RSGDP88(-6)) | -0.026000 | 0.340954 | -0.036438 | 0.212256 | -0.005783 |
| | (0.01414) | (0.23978) | (0.25945) | (0.17672) | (0.05091) |
| | (-1.83831) | (1.42195) | (-0.14044) | (1.20106) | (-0.11360) |
| D(RSGDP88(-7)) | -0.018589 | 0.238797 | -0.009068 | 0.135744 | -0.004025 |
| | (0.01144) | (0.19402) | (0.20994) | (0.14300) | (0.04119) |
| | (-1.62436) | (1.23077) | (-0.04320) | (0.94926) | (-0.09772) |
| D(TOT(-1)) | 0.037622 | 0.852462 | 0.184423 | 0.206165 | 0.162335 |
| | (0.02510) | (0.42553) | (0.46044) | (0.31362) | (0.09034) |
| | (1.49895) | (2.00332) | (0.40054) | (0.65736) | (1.79688) |
| D(TOT(-2)) | 0.052138 | 0.733155 | -0.504007 | 0.029240 | 0.007103 |
| | (0.03323) | (0.56345) | (0.60968) | (0.41528) | (0.11963) |
| | (1.56879) | (1.30118) | (-0.82667) | (0.07041) | (0.05937) |
| D(TOT(-3)) | 0.012140 | 0.424101 | -0.095202 | 0.087611 | 0.093802 |
| | (0.02372) | (0.40207) | (0.43506) | (0.29634) | (0.08536) |

| | | | | | |
|---|---|---|---|---|---|
| | (0.51188) | (1.05479) | (-0.21883) | (0.29565) | (1.09886) |
| D(TOT(-4)) | 0.027774 | -0.242494 | 0.068484 | -0.410945 | 0.026484 |
| | (0.02138) | (0.36255) | (0.39229) | (0.26721) | (0.07697) |
| | (1.29878) | (-0.66886) | (0.17457) | (-1.53792) | (0.34407) |
| D(TOT(-5)) | 0.058514 | 0.606145 | -0.065823 | -0.546630 | 0.036610 |
| | (0.02222) | (0.37667) | (0.40757) | (0.27762) | (0.07997) |
| | (2.63369) | (1.60922) | (-0.16150) | (-1.96902) | (0.45780) |
| D(TOT(-6)) | 0.028115 | -0.206556 | 0.081216 | -0.328711 | 0.009431 |
| | (0.02329) | (0.39491) | (0.42731) | (0.29106) | (0.08384) |
| | (1.20700) | (-0.52305) | (0.19006) | (-1.12936) | (0.11248) |
| D(TOT(-7)) | 0.054334 | 0.232609 | -0.264501 | -0.388560 | 0.042530 |
| | (0.02091) | (0.35451) | (0.38359) | (0.26128) | (0.07526) |
| | (2.59847) | (0.65615) | (-0.68954) | (-1.48714) | (0.56507) |
| D(RINTUS1(-1)) | 0.093914 | 1.747476 | -0.143318 | 0.045872 | 0.089513 |
| | (0.05979) | (1.01362) | (1.09678) | (0.74707) | (0.21520) |
| | (1.57081) | (1.72400) | (-0.13067) | (0.06140) | (0.41595) |
| D(RINTUS1(-2)) | 0.166186 | 0.561577 | 0.105034 | -1.943294 | 0.150444 |
| | (0.05756) | (0.97584) | (1.05590) | (0.71922) | (0.20718) |
| | (2.88726) | (0.57548) | (0.09947) | (-2.70195) | (0.72616) |
| D(RINTUS1(-3)) | 0.129134 | 0.843873 | 0.718815 | -0.571453 | 0.259949 |
| | (0.05589) | (0.94756) | (1.02530) | (0.69838) | (0.20117) |
| | (2.31049) | (0.89058) | (0.70108) | (-0.81826) | (1.29216) |
| D(RINTUS1(-4)) | 0.187516 | 1.769538 | -0.374536 | -0.988087 | -0.024005 |
| | (0.05850) | (0.99187) | (1.07325) | (0.73103) | (0.21058) |
| | (3.20517) | (1.78405) | (-0.34898) | (-1.35163) | (-0.11399) |
| D(RINTUS1(-5)) | -0.012538 | 1.063984 | -0.806857 | 0.692068 | 0.335533 |
| | (0.04888) | (0.82874) | (0.89674) | (0.61081) | (0.17595) |
| | (-0.25648) | (1.28386) | (-0.89977) | (1.13304) | (1.90699) |
| D(RINTUS1(-6)) | 0.034889 | -0.886583 | 0.017810 | -1.335195 | 0.042648 |
| | (0.04491) | (0.76136) | (0.82383) | (0.56114) | (0.16164) |
| | (0.77689) | (-1.16447) | (0.02162) | (-2.37941) | (0.26384) |
| D(RINTUS1(-7)) | -0.095449 | 0.654726 | 0.304676 | 1.253865 | -0.146454 |
| | (0.04274) | (0.72455) | (0.78399) | (0.53401) | (0.15383) |
| | (-2.23343) | (0.90363) | (0.38862) | (2.34801) | (-0.95207) |
| R-squared | 0.741097 | 0.600474 | 0.715921 | 0.758340 | 0.509778 |
| Adj. R-squared | 0.417468 | 0.101065 | 0.360822 | 0.456266 | -0.102999 |
| Sum sq. resids | 0.000114 | 0.032700 | 0.038286 | 0.017763 | 0.001474 |
| S.E. equation | 0.002016 | 0.034174 | 0.036978 | 0.025187 | 0.007255 |
| F-statistic | 2.289956 | 1.202370 | 2.016115 | 2.510440 | 0.831915 |
| Log likelihood | 332.8761 | 151.7247 | 146.6781 | 171.2530 | 250.9063 |
| Akaike AIC | -9.277379 | -3.616396 | -3.458690 | -4.226656 | -6.715823 |
| Schwarz SC | -8.063008 | -2.402024 | -2.244318 | -3.012284 | -5.501451 |
| Mean dependent | -0.000455 | 0.003112 | -1.29E-05 | 0.002660 | -8.02E-05 |
| S.D. dependent | 0.002641 | 0.036044 | 0.046252 | 0.034157 | 0.006908 |
| Determinant Residual Covariance | | 5.34E-22 | | | |
| Log Likelihood | | 1113.366 | | | |
| Akaike Information Criteria | | -28.98018 | | | |
| Schwarz Criteria | | -22.70593 | | | |

# APPENDIX E

## Results Co-integration, Error-Correction of R

Sample: 1980:1 1997:4
Included observations: 66
Test assumption: No deterministic trend in the data
Series: REX GDPDLABOR RSGDP88 TOT RINTUS1
Lags interval: 1 to 5

| Eigenvalue | Likelihood Ratio | 5 Percent Critical Value | 1 Percent Critical Value | Hypothesized No. of CE(s) |
|---|---|---|---|---|
| 0.390472 | 110.1013 | 76.07 | 84.45 | None ** |
| 0.376152 | 77.42667 | 53.12 | 60.16 | At most 1 ** |
| 0.296422 | 46.28469 | 34.91 | 41.07 | At most 2 ** |
| 0.219146 | 23.08060 | 19.96 | 24.60 | At most 3 * |
| 0.097276 | 6.754342 | 9.24 | 12.97 | At most 4 |

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 4 cointegrating equation(s) at 5% significance level

Unnormalized Cointegrating Coefficients:

| REX | GDPDLABOR | RSGDP88 | TOT | RINTUS1 | C |
|---|---|---|---|---|---|
| -114.1659 | 1.988917 | -6.000016 | -2.599104 | -9.759026 | 7.983762 |
| 138.5908 | -1.038482 | 4.350012 | 3.415384 | 7.601977 | -10.05360 |
| 32.91483 | -0.232610 | 0.906909 | -1.935134 | -14.37559 | 0.929684 |
| -81.66659 | 1.290905 | 0.250250 | -2.260871 | 0.031828 | 4.635067 |
| -64.89792 | 2.560839 | -8.195606 | -0.036819 | 1.350362 | 3.621584 |

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

| REX | GDPDLABOR | RSGDP88 | TOT | RINTUS1 | C |
|---|---|---|---|---|---|
| 1.000000 | -0.017421 | 0.052555 | 0.022766 | 0.085481 | -0.069931 |
| | (0.00273) | (0.00997) | (0.00530) | (0.02742) | (0.00541) |
| Log likelihood | 1095.094 | | | | |

Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)

| REX | GDPDLABOR | RSGDP88 | TOT | RINTUS1 | C |
|---|---|---|---|---|---|
| 1.000000 | 0.000000 | 0.015411 | 0.026061 | 0.031735 | -0.074512 |
| | | (0.01060) | (0.00868) | (0.04713) | (0.00897) |
| 0.000000 | 1.000000 | -2.132101 | 0.189122 | -3.085084 | -0.262929 |
| | | (0.83878) | (0.68675) | (3.72863) | (0.70997) |
| Log likelihood | 1110.665 | | | | |

Normalized Cointegrating Coefficients: 3 Cointegrating Equation(s)

| REX | GDPDLABOR | RSGDP88 | TOT | RINTUS1 | C |
|---|---|---|---|---|---|
| 1.000000 | 0.000000 | 0.000000 | -0.413864 | -2.550872 | 0.456975 |
| | | | (4.16324) | (24.1698) | (4.96901) |
| 0.000000 | 1.000000 | 0.000000 | 61.05125 | 354.2099 | -73.79238 |
| | | | (586.145) | (3402.87) | (699.589) |
| 0.000000 | 0.000000 | 1.000000 | 28.54561 | 167.5788 | -34.48685 |
| | | | (273.113) | (1585.56) | (325.971) |
| Log likelihood | 1122.267 | | | | |

Normalized Cointegrating Coefficients: 4 Cointegrating Equation(s)

| REX | GDPDLABOR | RSGDP88 | TOT | RINTUS1 | C |
|---|---|---|---|---|---|
| 1.000000 | 0.000000 | 0.000000 | 0.000000 | -0.151165 | -0.037716 |
| | | | | (0.03560) | (0.00207) |
| 0.000000 | 1.000000 | 0.000000 | 0.000000 | 0.216636 | -0.817890 |
| | | | | (2.35844) | (0.13698) |
| 0.000000 | 0.000000 | 1.000000 | 0.000000 | 2.062897 | -0.366314 |
| | | | | (0.72670) | (0.04221) |
| 0.000000 | 0.000000 | 0.000000 | 1.000000 | 5.798297 | -1.195299 |
| | | | | (0.86574) | (0.05028) |
| Log likelihood | 1130.431 | | | | |

Sample(adjusted): 1981:3 1997:4
Included observations: 66 after adjusting endpoints
Standard errors & t-statistics in parentheses

| Cointegrating Eq: | CointEq1 |
|---|---|
| REX(-1) | 1.000000 |
| GDPDLABOR(-1) | -0.017421 |
| | (0.00273) |
| | (-6.38118) |
| RSGDP88(-1) | 0.052555 |
| | (0.00997) |
| | (5.26988) |
| TOT(-1) | 0.022766 |
| | (0.00530) |
| | (4.29251) |
| RINTUS1(-1) | 0.085481 |
| | (0.02742) |
| | (3.11729) |
| C | -0.069931 |
| | (0.00541) |
| | (-12.9346) |

| Error Correction: | D(REX) | D(GDPDLABOR) | D(RSGDP88) | D(TOT) | D(RINTUS1) |
|---|---|---|---|---|---|
| CointEq1 | -0.713355 | -5.495844 | -0.529226 | 0.886605 | -0.711835 |
| | (0.15725) | (3.95370) | (3.94398) | (3.13668) | (0.73922) |
| | (-4.53644) | (-1.39005) | (-0.13419) | (0.28266) | (-0.96296) |
| D(REX(-1)) | 0.500339 | 8.910218 | 2.208137 | 0.074723 | 1.483076 |
| | (0.17091) | (4.29707) | (4.28651) | (3.40910) | (0.80342) |
| | (2.92756) | (2.07356) | (0.51514) | (0.02192) | (1.84595) |
| D(REX(-2)) | -0.098042 | -3.438104 | -3.556581 | 8.107293 | -0.897165 |
| | (0.22741) | (5.71772) | (5.70367) | (4.53618) | (1.06904) |
| | (-0.43112) | (-0.60131) | (-0.62356) | (1.78725) | (-0.83923) |
| D(REX(-3)) | 0.147496 | 2.174682 | -0.408896 | 3.004900 | 2.190916 |
| | (0.24303) | (6.11039) | (6.09537) | (4.84771) | (1.14245) |
| | (0.60691) | (0.35590) | (-0.06708) | (0.61986) | (1.91773) |
| D(REX(-4)) | 0.155469 | -2.094223 | -4.558078 | -6.438843 | 0.620489 |
| | (0.24530) | (6.16749) | (6.15233) | (4.89301) | (1.15313) |
| | (0.63379) | (-0.33956) | (-0.74087) | (-1.31593) | (0.53809) |
| D(REX(-5)) | 0.065726 | -1.958337 | -1.102090 | -19.97306 | 0.841511 |
| | (0.23952) | (6.02207) | (6.00727) | (4.77764) | (1.12594) |
| | (0.27441) | (-0.32519) | (-0.18346) | (-4.18053) | (0.74738) |
| D(GDPDLABOR(-1)) | 0.008601 | -0.102175 | 0.114320 | 0.130844 | -0.071575 |

| | | | | | |
|---|---|---|---|---|---|
| | (0.00795) | (0.19989) | (0.19939) | (0.15858) | (0.03737) |
| | (1.08192) | (-0.51117) | (0.57334) | (0.82509) | (-1.91517) |
| D(GDPDLABOR(-2)) | 0.025276 | 0.146135 | 0.514261 | -0.108336 | -0.006481 |
| | (0.00855) | (0.21488) | (0.21435) | (0.17047) | (0.04018) |
| | (2.95750) | (0.68009) | (2.39918) | (-0.63550) | (-0.16133) |
| D(GDPDLABOR(-3)) | 0.033909 | 0.298352 | 0.320798 | -0.179910 | -0.039581 |
| | (0.00963) | (0.24208) | (0.24148) | (0.19205) | (0.04526) |
| | (3.52191) | (1.23246) | (1.32845) | (-0.93677) | (-0.87450) |
| D(GDPDLABOR(-4)) | 0.022361 | 0.610812 | 0.028022 | 0.016790 | 0.060537 |
| | (0.01095) | (0.27541) | (0.27474) | (0.21850) | (0.05149) |
| | (2.04136) | (2.21781) | (0.10200) | (0.07684) | (1.17561) |
| D(GDPDLABOR(-5)) | 0.026207 | 0.432446 | -0.005176 | -0.159512 | 0.088263 |
| | (0.00921) | (0.23160) | (0.23103) | (0.18374) | (0.04330) |
| | (2.84505) | (1.86721) | (-0.02240) | (-0.86813) | (2.03830) |
| D(RSGDP88(-1)) | 0.033474 | 0.405859 | -0.592406 | -0.032100 | 0.046200 |
| | (0.01107) | (0.27828) | (0.27759) | (0.22077) | (0.05203) |
| | (3.02445) | (1.45847) | (-2.13408) | (-0.14540) | (0.88796) |
| D(RSGDP88(-2)) | 0.026767 | 0.310186 | -0.645918 | -0.123920 | 0.037547 |
| | (0.01126) | (0.28320) | (0.28250) | (0.22468) | (0.05295) |
| | (2.37644) | (1.09530) | (-2.28642) | (-0.55155) | (0.70912) |
| D(RSGDP88(-3)) | 0.019127 | 0.268497 | -0.638249 | -0.099742 | 0.035071 |
| | (0.01024) | (0.25756) | (0.25693) | (0.20434) | (0.04816) |
| | (1.86717) | (1.04246) | (-2.48416) | (-0.48813) | (0.72829) |
| D(RSGDP88(-4)) | 0.009688 | 0.053289 | -0.223154 | 0.035194 | 0.082379 |
| | (0.00941) | (0.23667) | (0.23609) | (0.18776) | (0.04425) |
| | (1.02919) | (0.22516) | (-0.94521) | (0.18744) | (1.86165) |
| D(RSGDP88(-5)) | 0.009859 | 0.087889 | -0.089148 | -0.032870 | 0.028202 |
| | (0.00747) | (0.18785) | (0.18739) | (0.14903) | (0.03512) |
| | (1.31956) | (0.46787) | (-0.47573) | (-0.22055) | (0.80297) |
| D(TOT(-1)) | 0.011087 | 0.075568 | -0.100253 | -0.039922 | 0.063566 |
| | (0.00683) | (0.17173) | (0.17131) | (0.13625) | (0.03211) |
| | (1.62321) | (0.44003) | (-0.58521) | (-0.29301) | (1.97972) |
| D(TOT(-2)) | 0.005084 | 0.117518 | -0.061867 | 0.096995 | -0.043482 |
| | (0.00635) | (0.15968) | (0.15929) | (0.12668) | (0.02985) |
| | (0.80044) | (0.73597) | (-0.38840) | (0.76566) | (-1.45644) |
| D(TOT(-3)) | -0.000964 | -0.165693 | 0.179806 | -0.079244 | 0.049493 |
| | (0.00651) | (0.16374) | (0.16333) | (0.12990) | (0.03061) |
| | (-0.14796) | (-1.01194) | (1.10085) | (-0.61003) | (1.61671) |
| D(TOT(-4)) | 0.007918 | 0.065008 | -0.051873 | -0.117078 | -0.057458 |
| | (0.00649) | (0.16330) | (0.16289) | (0.12955) | (0.03053) |
| | (1.21916) | (0.39810) | (-0.31845) | (-0.90372) | (-1.88194) |
| D(TOT(-5)) | -0.001968 | 0.171999 | 0.032763 | 0.063551 | -0.002447 |
| | (0.00651) | (0.16363) | (0.16323) | (0.12982) | (0.03059) |
| | (-0.30244) | (1.05115) | (0.20072) | (0.48955) | (-0.07998) |
| D(RINTUS1(-1)) | 0.060874 | 0.828010 | -0.447835 | -0.194391 | 0.142696 |
| | (0.03812) | (0.95853) | (0.95618) | (0.76046) | (0.17922) |
| | (1.59676) | (0.86383) | (-0.46836) | (-0.25562) | (0.79622) |
| D(RINTUS1(-2)) | 0.065144 | 1.113463 | -0.688129 | -0.641060 | 0.041871 |
| | (0.03509) | (0.88216) | (0.87999) | (0.69987) | (0.16494) |
| | (1.85669) | (1.26220) | (-0.78197) | (-0.91597) | (0.25386) |
| D(RINTUS1(-3)) | 0.058113 | 0.127155 | 0.220489 | -0.928610 | 0.288394 |
| | (0.03171) | (0.79725) | (0.79529) | (0.63250) | (0.14906) |

| | | | | | |
|---|---|---|---|---|---|
| | (1.83271) | (0.15949) | (0.27724) | (-1.46816) | (1.93474) |
| D(RINTUS1(-4)) | 0.057721 | 0.625741 | -0.060154 | -0.513370 | -0.027851 |
| | (0.02715) | (0.68275) | (0.68107) | (0.54166) | (0.12765) |
| | (2.12562) | (0.91650) | (-0.08832) | (-0.94777) | (-0.21818) |
| D(RINTUS1(-5)) | 0.030039 | 0.234951 | -0.411009 | -0.160210 | 0.329080 |
| | (0.02572) | (0.64671) | (0.64512) | (0.51307) | (0.12091) |
| | (1.16787) | (0.36330) | (-0.63711) | (-0.31226) | (2.72159) |
| R-squared | 0.582095 | 0.422165 | 0.646497 | 0.601374 | 0.447587 |
| Adj. R-squared | 0.320905 | 0.061018 | 0.425557 | 0.352233 | 0.102329 |
| Sum sq. resids | 7.59E-05 | 0.047973 | 0.047737 | 0.030195 | 0.001677 |
| S.E. equation | 0.001377 | 0.034631 | 0.034546 | 0.027475 | 0.006475 |
| F-statistic | 2.228625 | 1.168955 | 2.926124 | 2.413788 | 1.296386 |
| Log likelihood | 357.6554 | 144.8338 | 144.9962 | 160.1117 | 255.5033 |
| Akaike AIC | -10.05016 | -3.601023 | -3.605946 | -4.063992 | -6.954646 |
| Schwarz SC | -9.187572 | -2.738432 | -2.743355 | -3.201401 | -6.092055 |
| Mean dependent | -0.000341 | 0.002366 | -0.000343 | 0.001687 | 8.58E-06 |
| S.D. dependent | 0.001671 | 0.035739 | 0.045580 | 0.034137 | 0.006834 |
| Determinant Residual Covariance | | 2.67E-21 | | | |
| Log Likelihood | | 1095.094 | | | |
| Akaike Information Criteria | | -29.06347 | | | |
| Schwarz Criteria | | -24.55145 | | | |

# APPENDIX F

## Percentage of misalignment in non-tradable relative price 1980 - 1997

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1980:1 | -0.151664 | -0.131987 | -0.070304 | -0.058644 |
| 1981:1 | -0.006327 | 0.067751 | -0.053571 | -0.071652 |
| 1982:1 | -0.004022 | 0.003459 | 0.021550 | -0.020671 |
| 1983:1 | -0.069792 | 0.007743 | 0.139653 | 0.146567 |
| 1984:1 | 0.058867 | 0.119048 | 0.041197 | -0.116249 |
| 1985:1 | -0.124762 | -0.159934 | -0.180432 | -0.217656 |
| 1986:1 | -0.095958 | 0.097096 | 0.100092 | 0.249282 |
| 1987:1 | -0.039050 | 0.024322 | 0.030273 | 0.130475 |
| 1988:1 | 0.098297 | 0.377470 | 0.222821 | 0.151625 |
| 1989:1 | 0.158444 | 0.033032 | 0.059652 | 0.067103 |
| 1990:1 | 0.067521 | 0.191482 | 0.043289 | -0.028100 |
| 1991:1 | 0.159084 | 0.265515 | 0.110665 | 0.060648 |
| 1992:1 | 0.352801 | 0.264968 | 0.105942 | 0.059197 |
| 1993:1 | 0.122665 | 0.161721 | 0.079703 | 0.123639 |
| 1994:1 | 0.367079 | 0.449533 | 0.152761 | 0.291584 |
| 1995:1 | 0.253707 | 0.232457 | 0.150542 | 0.074971 |
| 1996:1 | 0.148331 | 0.262556 | 0.140389 | 0.073866 |
| 1997:1 | 0.373269 | 0.568322 | -0.102500 | -0.358148 |

# APPENDIX G

## Percentage of misalignment in real exchange rate 1980 - 1997

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 1980:1 | 0.033568 | 0.098448 | 0.132330 | 0.116022 |
| 1981:1 | 0.132169 | 0.178275 | 0.055303 | 0.031591 |
| 1982:1 | 0.046187 | 0.046988 | 0.064499 | 0.049251 |
| 1983:1 | -0.031094 | 0.059786 | 0.145360 | 0.165731 |
| 1984:1 | 0.099585 | 0.129101 | 0.047496 | -0.094251 |
| 1985:1 | -0.081035 | -0.108963 | -0.133817 | -0.167391 |
| 1986:1 | -0.032802 | 0.053542 | 0.029537 | 0.110206 |
| 1987:1 | -0.024010 | 0.027350 | 0.028627 | 0.099689 |
| 1988:1 | 0.054037 | 0.183000 | 0.076992 | 0.072780 |
| 1989:1 | 0.108008 | 0.010004 | 0.029273 | 0.035840 |
| 1990:1 | 0.042505 | 0.080192 | 0.002691 | -0.011837 |
| 1991:1 | 0.129058 | 0.178706 | 0.014833 | -0.021631 |
| 1992:1 | 0.160036 | 0.122925 | 0.023099 | -0.015395 |
| 1993:1 | 0.059939 | 0.079718 | -0.006763 | 0.003337 |
| 1994:1 | 0.126497 | 0.156169 | 0.011049 | 0.071789 |
| 1995:1 | 0.048144 | 0.066358 | 0.002437 | 0.010801 |
| 1996:1 | 0.036973 | 0.086645 | 0.001948 | -0.026734 |
| 1997:1 | 0.159064 | 0.235317 | -0.178022 | -0.356124 |

# APPENDIX H

## data of forecasting

| years | GDPDLABOR | RSGDP88 | TOT | RINTUS1 |
|---|---|---|---|---|
| 1998.1 | 0.46458 | 0.383162 | 0.900996 | 0.042277 |
| 1998.2 | 0.510941 | 0.270851 | 0.88041 | 0.040262 |
| 1998.3 | 0.476568 | 0.311781 | 0.931061 | 0.03669 |
| 1998.4 | 0.549986 | 0.348027 | 0.921199 | 0.031605 |
| 1999.1 | 0.598552 | 0.312867 | 0.967158 | 0.032851 |
| 1999.2 | 0.543778 | 0.270339 | 0.959594 | 0.033864 |
| 1999.3 | 0.586965 | 0.293124 | 0.898602 | 0.035479 |

# APPENDIX I

## Quarterly data during 1980.01 to 1997.04 period

| obs | NTREX | REX | GDPDLABOR | RSGDP88 | TOT | RINTUS1 |
|---|---|---|---|---|---|---|
| 1980:1 | 0.053138 | 0.050070 | 0.504288 | 0.204679 | 0.942264 | -0.022650 |
| 1980:2 | 0.053830 | 0.051428 | 0.463904 | 0.244036 | 0.955381 | -0.039560 |
| 1980:3 | 0.055638 | 0.051243 | 0.478202 | 0.260592 | 0.921007 | -0.019370 |
| 1980:4 | 0.055814 | 0.050902 | 0.470223 | 0.225897 | 0.912007 | -0.001430 |
| 1981:1 | 0.057843 | 0.051219 | 0.490533 | 0.219611 | 0.885484 | 0.017972 |
| 1981:2 | 0.061652 | 0.051564 | 0.477535 | 0.229610 | 0.836365 | 0.039541 |
| 1981:3 | 0.057500 | 0.047034 | 0.455222 | 0.214251 | 0.817982 | 0.039893 |
| 1981:4 | 0.059723 | 0.046434 | 0.434554 | 0.207825 | 0.777480 | 0.045238 |
| 1982:1 | 0.064756 | 0.046347 | 0.463548 | 0.223173 | 0.715722 | 0.066478 |
| 1982:2 | 0.064732 | 0.046113 | 0.457885 | 0.219851 | 0.712371 | 0.071270 |
| 1982:3 | 0.065202 | 0.045374 | 0.443633 | 0.246473 | 0.695902 | 0.072981 |
| 1982:4 | 0.064167 | 0.045858 | 0.430283 | 0.232154 | 0.714669 | 0.061423 |
| 1983:1 | 0.064317 | 0.045762 | 0.468232 | 0.165742 | 0.711509 | 0.069591 |
| 1983:2 | 0.061001 | 0.046206 | 0.451637 | 0.205477 | 0.757468 | 0.072019 |
| 1983:3 | 0.060575 | 0.046331 | 0.466566 | 0.237941 | 0.764841 | 0.089969 |
| 1983:4 | 0.060384 | 0.046196 | 0.463956 | 0.262671 | 0.765033 | 0.083806 |
| 1984:1 | 0.060572 | 0.045157 | 0.465039 | 0.259389 | 0.745500 | 0.074413 |
| 1984:2 | 0.060074 | 0.044952 | 0.462320 | 0.257623 | 0.748277 | 0.088888 |
| 1984:3 | 0.062675 | 0.044366 | 0.482126 | 0.236819 | 0.707871 | 0.086737 |
| 1984:4 | 0.058769 | 0.040712 | 0.450774 | 0.194276 | 0.692742 | 0.080186 |
| 1985:1 | 0.052824 | 0.037029 | 0.397479 | 0.262012 | 0.700977 | 0.079933 |
| 1985:2 | 0.053737 | 0.037277 | 0.403144 | 0.252243 | 0.693700 | 0.071001 |
| 1985:3 | 0.053976 | 0.037598 | 0.416338 | 0.227383 | 0.696572 | 0.069831 |
| 1985:4 | 0.055720 | 0.038130 | 0.408298 | 0.196640 | 0.684316 | 0.062407 |
| 1986:1 | 0.043571 | 0.037964 | 0.423230 | 0.258170 | 0.871314 | 0.054376 |
| 1986:2 | 0.039605 | 0.038597 | 0.422589 | 0.254635 | 0.974531 | 0.059533 |
| 1986:3 | 0.038620 | 0.038846 | 0.446376 | 0.232729 | 1.005841 | 0.056688 |
| 1986:4 | 0.038317 | 0.038820 | 0.427677 | 0.271477 | 1.013118 | 0.059463 |
| 1987:1 | 0.039635 | 0.038701 | 0.427731 | 0.213703 | 0.976446 | 0.049935 |
| 1987:2 | 0.039972 | 0.038954 | 0.441032 | 0.258765 | 0.974531 | 0.045761 |
| 1987:3 | 0.040471 | 0.038774 | 0.463923 | 0.275513 | 0.958062 | 0.047113 |
| 1987:4 | 0.041034 | 0.039297 | 0.474516 | 0.317498 | 0.957679 | 0.046493 |
| 1988:1 | 0.039918 | 0.039762 | 0.480757 | 0.267999 | 0.996074 | 0.044705 |
| 1988:2 | 0.039419 | 0.039785 | 0.491876 | 0.335481 | 1.009288 | 0.049844 |
| 1988:3 | 0.038690 | 0.039142 | 0.525880 | 0.294565 | 1.011681 | 0.049552 |
| 1988:4 | 0.040196 | 0.039511 | 0.522984 | 0.301828 | 0.982957 | 0.046453 |
| 1989:1 | 0.041495 | 0.039362 | 0.523239 | 0.345106 | 0.948583 | 0.044324 |
| 1989:2 | 0.040182 | 0.038762 | 0.557522 | 0.309146 | 0.964669 | 0.035759 |
| 1989:3 | 0.040257 | 0.039309 | 0.553507 | 0.308707 | 0.976446 | 0.034262 |
| 1989:4 | 0.040173 | 0.039257 | 0.550670 | 0.314116 | 0.977212 | 0.033574 |
| 1990:1 | 0.040613 | 0.039057 | 0.565401 | 0.336858 | 0.961700 | 0.031804 |
| 1990:2 | 0.039753 | 0.039133 | 0.574627 | 0.338873 | 0.984393 | 0.040870 |
| 1990:3 | 0.040629 | 0.039365 | 0.616945 | 0.316560 | 0.968882 | 0.031879 |
| 1990:4 | 0.042909 | 0.040345 | 0.632644 | 0.321437 | 0.940253 | 0.021351 |
| 1991:1 | 0.043476 | 0.040229 | 0.614748 | 0.411331 | 0.925316 | 0.027219 |
| 1991:2 | 0.042408 | 0.039988 | 0.597119 | 0.421272 | 0.942934 | 0.032771 |
| 1991:3 | 0.041505 | 0.039923 | 0.674165 | 0.322884 | 0.961892 | 0.040577 |
| 1991:4 | 0.041864 | 0.040562 | 0.678848 | 0.275915 | 0.968882 | 0.043754 |
| 1992:1 | 0.041766 | 0.040330 | 0.638985 | 0.390974 | 0.965626 | 0.044051 |
| 1992:2 | 0.042800 | 0.040710 | 0.657853 | 0.377311 | 0.951168 | 0.042747 |
| 1992:3 | 0.043300 | 0.041621 | 0.708529 | 0.317470 | 0.961222 | 0.035390 |
| 1992:4 | 0.042441 | 0.040551 | 0.713512 | 0.309995 | 0.955477 | 0.036638 |
| 1993:1 | 0.042102 | 0.040445 | 0.651336 | 0.357132 | 0.960647 | 0.029023 |
| 1993:2 | 0.043667 | 0.041255 | 0.706093 | 0.381849 | 0.944753 | 0.028620 |
| 1993:3 | 0.043049 | 0.041504 | 0.771612 | 0.327406 | 0.964094 | 0.028442 |
| 1993:4 | 0.042211 | 0.041095 | 0.787449 | 0.343762 | 0.973573 | 0.028779 |
| 1994:1 | 0.041412 | 0.041598 | 0.715362 | 0.372299 | 1.004500 | 0.035468 |
| 1994:2 | 0.042829 | 0.042161 | 0.731154 | 0.376278 | 0.984393 | 0.046985 |
| 1994:3 | 0.045210 | 0.042726 | 0.817174 | 0.315261 | 0.945040 | 0.044742 |
| 1994:4 | 0.045101 | 0.042765 | 0.806602 | 0.341935 | 0.948200 | 0.052937 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1995:1 | 0.044830 | 0.043002 | 0.836463 | 0.336291 | 0.959211 | 0.046385 |
| 1995:2 | 0.046396 | 0.043997 | 0.856492 | 0.361087 | 0.948296 | 0.035411 |
| 1995:3 | 0.046348 | 0.044093 | 0.899382 | 0.320229 | 0.951360 | 0.036558 |
| 1995:4 | 0.049713 | 0.044410 | 0.843718 | 0.334289 | 0.893336 | 0.032612 |
| 1996:1 | 0.048786 | 0.044484 | 0.888058 | 0.362632 | 0.911815 | 0.031439 |
| 1996:2 | 0.047308 | 0.044268 | 0.858111 | 0.372011 | 0.935753 | 0.038459 |
| 1996:3 | 0.047661 | 0.044603 | 0.908884 | 0.316778 | 0.935848 | 0.038542 |
| 1996:4 | 0.047008 | 0.044501 | 0.895026 | 0.295656 | 0.946668 | 0.031701 |
| 1997:1 | 0.046074 | 0.043943 | 0.800909 | 0.402803 | 0.953753 | 0.036133 |
| 1997:2 | 0.045880 | 0.044294 | 0.784049 | 0.418935 | 0.965435 | 0.043721 |
| 1997:3 | 0.035037 | 0.034171 | 0.700096 | 0.283534 | 0.975297 | 0.040371 |
| 1997:4 | 0.030633 | 0.029031 | 0.633707 | 0.206997 | 0.947721 | 0.040107 |

# AUTOBIOGRAPHY

Mr. Somboon Rattanapanakul was born in Songkla province. I graduated from Ramkhamkaeng university in 1985. Beginning work in 1986 at Chulalongkhon University in position lecturer and started to study in master program in MA international economic and finance in 1995.