

Appendix: Macroeconometric model¹

The Bank of Thailand's macroeconometric model (BOTMM) is an economic forecasting tool, consisting of 25 behavioural equations and 41 identities. The BOTMM presents to the Monetary Policy Committee (MPC) an important tool for economic forecasting. The model is used to analyze the response of the economy to various exogenous shocks and policy changes. It also assists the MPC in formulating the optimal policy to achieve the goals of price stability and sustainable economic growth in the long run.

Improving the model

In this *Report*, the BOTMM was revised by incorporating the most recent published data, particularly the quarterly GDP figures of 2006 Q3 released by the NESDB on 4 December 2006. Other notable changes made to the model since the October 2006 *Report* are as follows.

1. The private durable goods consumption at 1988 constant prices equation (equation 1.1) was revised to include a one period change in real interest rate as another variable in the short run. The revision was consistent with the impact of real interest rate change on private durable goods consumption in the short run, in addition to the long run.

2. The exports of goods and services at 1988 constant prices equation (equation 1.8) was revised such that the nominal effective exchange rate (NEER) was replaced with the real effective exchange rate (REER), which could reflect both the impact of the exchange rate and domestic inflation compared with our trading partners', thus giving a more complete picture regarding the competitiveness of Thai exports. The revision was a result of improved availability of trading partners' economic data, which allowed the BOT to forecast their inflation rates. The calculation of the REER is shown in equation 3.6.

¹ The Bank of Thailand's macroeconometric model was first published in the July 2000 *Report*. Revisions to the model were noted in subsequent *Reports*.

A more prominent role of domestic inflation in explaining variations in exports through the incorporation of the REER resulted in an increase in the degree of pass through from the changes in those factors affecting inflation to exports. As shown in table A.1, a one-percentage depreciation in the baht would cause domestic inflation to rise relative to trading partners' inflation, which would be reflected in a higher REER. This would then result in lower price competitiveness of Thai exports. Hence, improvements in exports and growth as a result of the exchange rate depreciation would be less than in a case where NEER was a variable. Moreover, in a case where a one-percentage increase in Dubai oil price led to higher domestic retail oil prices as well as inflation compared with trading partners' inflation (given that the impact of Dubai oil price on some countries would be milder than for Thailand), price competitiveness of Thai exports would decline, affecting both exports and growth. In turn, a fall in the overall demand would result in a decline in core inflation.

3. The three-month deposit rate equation (equation 4.1) was revised such that the 14-day repurchase rate was replaced with the 1-day repurchase rate to reflect the policy rate change, which became effective on 17 January 2007.

4. The core consumer price index equation (equation 5.1) was revised such that the raw food price index was removed from the long run equation since their relationship has recently weakened compared with previously. Moreover, the import price deflator in baht terms was removed from the short run equation to correct for serial correlation. Such a revision was partly responsible for a decrease in the elasticity of inflation to changes in the exchange rate as shown in table A.1 compared with the results obtained in the previous *Report*.

5. The import price deflator equation (equation 5.13) was revised such that the Dubai oil price was included as an additional variable in the short run equation, given its good performance in explaining variations in import price in the past. The adjusted R-squared value of the revised equation thus increased from 27 to 40 per cent.

Effect of variations in the exchange rate and crude oil price on the Thai economy

The model in this *Report* was used to analyze the effect of variations in the exchange rate and the crude oil price on the Thai economy. Table A.1 shows that a one-percentage depreciation in the exchange rate (baht per US dollar) would increase core inflation, headline inflation, and economic growth by 0.03, 0.04, and 0.21 per cent, respectively.

Moreover, a one-percentage increase in the Dubai crude oil price (US dollars per barrel of Dubai crude oil) would affect core inflation, headline inflation, and economic growth by -0.01, 0.04, and -0.08 per cent respectively, similar to that in the previous *Report*.

Table A.1 Summary of the effect of variations in the exchange rate and crude oil price		
	Effect on the Thai economy in the 4 th quarter ahead	
	A 1% depreciation in the exchange rate	A 1% increase in crude oil price
Core inflation	0.03	-0.01
Headline inflation	0.04	0.04
Economic growth	0.21	-0.08

Source: Macroeconometric model, Bank of Thailand

Corporate and household sector models

The corporate and household sector models are tools developed by the BOT to help assess the financial conditions of the Thai corporate and household sectors. The assessment is part of the effort to ensure financial stability, which itself, in turn, is closely intertwined with monetary stability and long-term economic growth, the main objectives of monetary policy under inflation targeting. In this *Report*, the BOT has revised the corporate and household sector models using the latest released data, especially those pertaining to listed companies, household credits, and GDP.

1.8.2 Exports of services at 1988 constant prices

$$XSR = RXSR * XR$$

1.9 Imports of goods and services at 1988 constant prices

$$\Delta \ln(MRsa) = 1.115 * \Delta \ln(DDsa) + 0.610 * \Delta \ln(XRsa) - 0.245 * \Delta \ln((PM\$sa * FX88) / CPIsa) - 0.275 * ecmMR(-1)$$

(10.99) (6.57) (-3.40) (-3.02)

Adjusted R-Squared = 0.79 S.E. of regression = 0.0267 LM(2) : 0.80 (0.46)

$$ecmMR = \ln(MRsa) - (-3.747 + 1.005 * \ln(DDsa) + 0.508 * \ln(XRsa) - 0.229 * \ln((PM\$sa * FX88) / CPIsa))$$

1.9.1 Imports of goods at 1988 constant prices

$$MGR = RMGR * MR$$

1.9.2 Imports of services at 1988 constant prices

$$MSR = RMSR * MR$$

1.10 Gross domestic product at 1988 constant prices

$$GDPR = CPR + CGOVR + IPR + IPUB + (XR - MR) + OTHGDP$$

1.11 Gross domestic product at current market prices

$$GDPN = ((CPR * CPI) + (CGOVR * PGCON) + (IPR * PIP) + (IPUB * PIFX) + ((XR * PXS * FX88 / 100) - (MR * PMS * FX88 / 100)) + (OTHGDP * POTHGDP)) / 100$$

1.12 Domestic demand

$$DD = GDPR - XR + MR$$

2. Government sector

2.1 Government revenue

$$GREV = TAXREV + OTHREV$$

2.2 Tax revenue

$$TAXREV = TD + TIND$$

2.3 Direct tax

$$TD = TH + TC$$

$$TH = RH * GDPN$$

$$TC = RC * GDPN$$

2.4 Indirect tax

$$TIND = TVAT + TEXTC + OTHTIND$$

$$TVAT = RVAT * (CPR * CPI / 100)$$

$$TEXTC = REXC * (CPR * CPI / 100)$$

$$OTHTIND = ROTHIND * (CPR * CPI / 100)$$

2.5 Government cash balance

$$GCB = GREV - (GCURRENT + GCAPITAL) + NONBUDGET$$

3. External sector

3.1 Current account

$$CURRENTS = (((XGR * PXS) - (MGR * PMS)) + ((XSR * PXSS) - (MSR * PMSS))) / (25.29^3 * 100)$$

$$CURRENTB = CURRENTS * FX$$

^{3/} The Baht/USD exchange rate in 1988 is 25.29.

3.2 Capital and financial account

$$\begin{aligned} \text{CAPITALS} &= \text{CAPITALSPRI} + \text{OTHCAPS} \\ \text{CAPITALB} &= \text{CAPITALS} * \text{FX} \end{aligned}$$

3.3 Balance of payments

$$\begin{aligned} \text{BPB} &= \text{CAPITALS} * \text{FX} + \text{CURRENTS} * \text{FX} + \text{OTHBP} \\ \text{BPS} &= \text{BPB} / \text{FX} \end{aligned}$$

3.4 International reserves

$$\text{RESERVE} = \text{BPS} + \text{RESERVE}(-1)$$

3.5 Net foreign assets

$$\text{NFA} = \text{NFA}(-1) + \text{BPB} + \text{OTHNFA}$$

3.6 Exchange rate

$$\begin{aligned} \ln(\text{FX88}) &= \ln(\text{FX88}(-1)) + (\ln(1+\text{FEDFUND}/400) - \ln(1+\text{RP1D}/400)) + \Delta \ln(\text{CPIsa}/\text{CPIUSsa}) + \text{RISK} \\ \text{RISK} &= 0.907 * \Delta \ln(\text{REGIONFX}) - 0.336 * \Delta (\text{BPB}(-1)/\text{GDPN}(-1)) \\ \text{FX} &= (\text{FX88} * 25.29^3) / 100 \\ \text{NEER} &= \text{REGIONFX} * 100 / \text{FX94} \\ \text{REER} &= \text{NEER} / (\text{TPCPI}/\text{CPI94}) \end{aligned}$$

3.7 Net flows of private financial account

$$\begin{aligned} \text{CAPITALSPRI} &= 1.150 * \Delta (\text{MLR} - \text{FEDFUND}) - 0.810 * \text{CURRENTS} - 25.803 * \Delta \ln(\text{FX88}) + 59.006 * \Delta \ln(\text{GDPRsa}) \\ &\quad (2.11) \qquad \qquad \qquad (-6.51) \qquad \qquad \qquad (-4.66) \qquad \qquad \qquad (3.98) \\ \text{Adjusted R-Squared} &= 0.65 \qquad \qquad \qquad \text{S.E. of regression} = 2.2391 \qquad \qquad \qquad \text{LM}(2) : 1.42 (0.25) \end{aligned}$$

4. Monetary sector

4.1 Three-month deposit rate

$$\begin{aligned} \Delta \text{RD3M} &= 0.325 * \Delta \text{RP1D} - 0.191 * \text{ecmRD3M}(-1) \\ &\quad (7.90) \qquad \qquad \qquad (-4.76) \\ \text{Adjusted R-Squared} &= 0.69 \qquad \qquad \qquad \text{S.E. of regression} = 0.4235 \qquad \qquad \qquad \text{LM}(2) : 0.34 (0.72) \\ \text{ecmRD3M} &= \text{RD3M} - 0.809 * \text{RP1D} \end{aligned}$$

4.2 Minimum lending rate

$$\begin{aligned} \text{MLR} &= 2.335 + 0.439 * \text{RD3M} + 0.771 * \text{MLR}(-1) - 0.254 * \text{MLR}(-2) \\ &\quad (11.36) (9.24) \qquad \qquad (8.05) \qquad \qquad (-3.92) \\ \text{Adjusted R-Squared} &= 0.99 \qquad \qquad \qquad \text{S.E. of regression} = 0.1940 \qquad \qquad \qquad \text{LM}(2) : 3.14 (0.06) \end{aligned}$$

4.3 Private credit

$$\begin{aligned} \Delta \ln(\text{PCREDITsa}) &= -0.012 * \Delta \text{MLR} + 0.608 * \Delta \ln(\text{GDPNsa}) - 0.002 * \ln(\text{NPL}(-2)) + 0.350 * \Delta \ln(\text{PCREDITsa}(-1)) + 0.0001 * (\text{CAPITALSPRI}(-1) * \text{FX}(-1)) \\ &\quad (-1.62) \qquad \qquad (2.38) \qquad \qquad (-1.87) \qquad \qquad (2.24) \qquad \qquad (1.92) \\ \text{Adjusted R-Squared} &= 0.43 \qquad \qquad \qquad \text{S.E. of regression} = 0.0153 \qquad \qquad \qquad \text{LM}(2) : 0.37 (0.69) \end{aligned}$$

4.4 Net claims on government

$$\begin{aligned} \Delta \text{CLAIMG} &= -0.410 * (\text{GCB} - \text{FINB}) - 0.104 * \text{CLAIMG}(-1) \\ &\quad (-6.12) \qquad \qquad \qquad (-2.83) \\ \text{Adjusted R-Squared} &= 0.57 \qquad \qquad \qquad \text{S.E. of regression} = 37.1790 \qquad \qquad \qquad \text{LM}(2) : 1.40 (0.26) \end{aligned}$$

^{3/} The Baht/USD exchange rate in 1988 is 25.29.

4.5 Money supply

$$M2A^S = NFA + CLAIMG + PCREDIT + OTHM2A$$

$$\Delta \ln(M2A^D_{sa} * 100 / CPI_{sa}) = 0.239 * \Delta \ln(GDPR_{sa}) - 0.007 * \Delta RD3M + 0.002 * CINFEX - 0.234 * ecmM2A^D(-1)$$

(2.61) (-2.24) (3.41) (-4.36)

Adjusted R-Squared = 0.42 S.E. of regression = 0.0121 LM(2) : 0.04 (0.96)

$$ecmM2A^D = \ln(M2A^D_{sa} * 100 / CPI_{sa}) - (4.280 + 0.560 * \ln(GDPR_{sa}) - 0.004 * RD3M)$$

4.6 Securities value

$$\Delta \ln(BM_{CAP}) = 0.001 * \Delta(CAPITALS * FX) + 1.615 * \Delta \ln(GDPR_{sa}) - 0.057 * \Delta(MLR) - 0.256 * ecmBM_{CAP}(-1)$$

(4.55) (2.17) (-2.39) (-2.31)

Adjusted R-Squared = 0.35 S.E. of regression = 0.1046 LM(2) : 0.40 (0.67)

$$ecmBM_{CAP} = \ln(BM_{CAP}) - (0.002 * (CAPITALS * FX) + 1.366 * \ln(GDPR_{sa}) - 0.083 * MLR)$$

5. Price index

5.1 Core consumer price index

$$\Delta \ln(CORE_{sa}) = 0.002 * (GDPR_{sa}(-1) / GDPR_HSM(-1)) + 0.620 * \Delta \ln(CORE_{sa}(-1)) - 0.131 * ecmCORE(-1)$$

(2.80) (5.05) (-3.64)

Adjusted R-Squared = 0.70 S.E. of regression = 0.0034 LM(2) : 1.38 (0.27)

$$ecmCORE = \ln(CORE_{sa}) - (4.155 + 0.051 * \ln(PM_{sa} * FX88) + 0.005 * \ln(AVG_{EARN}_{sa}) + 0.134 * \ln(CPI_{EN}_{sa}(-2)))$$

5.2 Average earnings

$$\Delta \ln(AVG_{EARN}_{sa}) = 0.309 * \Delta \ln(MINWAGE) + 0.814 * \Delta \ln(CPI_{sa}) - 0.307 * ecmAVG_{EARN}(-1)$$

(3.65) (5.48) (-3.49)

Adjusted R-Squared = 0.37 S.E. of regression = 0.0117 LM(2) : 0.46 (0.63)

$$ecmAVG_{EARN} = \ln(AVG_{EARN}_{sa}) - (2.335 + 0.777 * \ln(MINWAGE) + 0.544 * \ln(CPI_{sa}))$$

5.3 Energy price index

$$\Delta \ln(CPI_{EN}_{sa}) = 0.537 * \Delta \ln(RPPI_{sa}) + 0.029 * OILCONTROL - 0.323 * ecmCPI_{EN}(-1)$$

(15.14) (3.91) (-4.76)

Adjusted R-Squared = 0.78 S.E. of regression = 0.0159 LM(2) : 0.67 (0.51)

$$ecmCPI_{EN} = \ln(CPI_{EN}_{sa}) - (1.1207 + 0.786 * \ln(RPPI_{sa}))$$

5.4 Retail petroleum price index

$$\Delta \ln(RPPI_{sa}) = 0.371 * \Delta \ln(DUBA_{sa}) + 0.471 * \Delta \ln(FX88) + 0.208 * \Delta \ln(RPPI_{sa}(-2)) - 0.360 * ecmRPPI(-1)$$

(9.96) (6.95) (3.27) (-4.96)

Adjusted R-Squared = 0.73 S.E. of regression = 0.0287 LM(2) : 0.11 (0.89)

$$ecmRPPI = \ln(RPPI_{sa}) - (-0.374 + 0.560 * \ln(DUBA_{sa}) + 0.725 * \ln(FX88))$$

5.5 Raw food price index

$$\Delta \ln(CPI_{RFOOD}_{sa}) = 0.009 + 0.291 * \Delta \ln(FARMPRICE_{sa}) - 0.078 * ecmCPI_{RFOOD}(-1)$$

(4.02) (5.33) (-2.34)

Adjusted R-Squared = 0.36 S.E. of regression = 0.0163 LM(2) : 0.59 (0.56)

$$ecmCPI_{RFOOD} = \ln(CPI_{RFOOD}_{sa}) - 1.024 * \ln(FARMPRICE_{sa})$$

5.6 Farm price index (12 main products)

$$\Delta \ln(FARMPRICE_{12sa}) = 1.004 * \Delta \ln(WFP_{12sa}) + 0.618 * \Delta \ln(FX88) - 0.360 * ecmFARMPRICE_{12}(-1)$$

(8.85) (8.32) (-3.98)

Adjusted R-Squared = 0.68 S.E. of regression = 0.0308 LM(2) : 0.94 (0.40)

$$ecmFARMPRICE_{12} = \ln(FARMPRICE_{12sa}) - (-5.126 + 1.107 * \ln(WFP_{12sa}) + 1.018 * \ln(FX88))$$

5.7 Farm price index

$$\text{FARMPRICE} = (\text{WFARMPRICE}_{12} * \text{FARMPRICE}_{12}) + (\text{WFARMPRICE}_{\text{OTH}} * \text{FARMPRICE}_{\text{OTH}})$$

5.8 Headline consumer price index

$$\text{CPI} = ((1 - \text{WEN} - \text{WRFOOD}) * \text{CORE}) + (\text{WEN} * \text{CPIEN}) + (\text{WRFOOD} * \text{CPIRFOOD})$$

5.9 Private investment deflator

$$\Delta \ln(\text{PIPs}_a) = 1.661 * \Delta \ln(\text{CPIs}_a) + 0.105 * \Delta \ln(\text{FX88}(-2)) - 0.270 * \text{ecmPIP}(-1)$$

(5.22) (2.02) (-2.58)

Adjusted R-Squared = 0.45 S.E. of regression = 0.0212 LM(2) : 0.11 (0.89)

$$\text{ecmPIP} = \ln(\text{PIPs}_a) - (-3.963 + 1.724 * \ln(\text{CPIs}_a) + 0.056 * \ln(\text{FX88}(-1)))$$

5.10 Public investment deflator

$$\Delta \ln(\text{PIFXs}_a) = 1.185 * \Delta \ln(\text{CPIs}_a) - 0.135 * \text{ecmPIFX}(-1)$$

(7.93) (-2.25)

Adjusted R-Squared = 0.32 S.E. of regression = 0.0130 LM(2) : 1.21 (0.31)

$$\text{ecmPIFX} = \ln(\text{PIFXs}_a) - (-1.400 + 1.245 * \ln(\text{CPIs}_a) + 0.040 * \ln(\text{FX88}(-1)))$$

5.11 Government consumption deflator

$$\Delta \ln(\text{PGCONs}_a) = 0.781 * \Delta \ln(\text{CPIs}_a) + 0.034 * \Delta \text{SALARY} - 0.167 * \text{ecmPGCON}(-1)$$

(4.18) (4.34) (-2.29)

Adjusted R-Squared = 0.26 S.E. of regression = 0.0157 LM(2) : 0.13 (0.88)

$$\text{ecmPGCON} = \ln(\text{PGCONs}_a) - (0.360 + 0.965 * \ln(\text{CPIs}_a) + 0.066 * \text{SALARY})$$

5.12 Export price deflator

$$\Delta \ln(\text{PXSs}_a) = 0.180 * \Delta \ln(\text{PMSs}_a(-1)) + 0.617 * \Delta \ln(\text{TPGDPs}_a) - 0.198 * \Delta \ln(\text{FX88}) - 0.274 * \text{ecmPXS}(-1)$$

(2.77) (2.88) (-4.67) (-4.38)

Adjusted R-Squared = 0.71 S.E. of regression = 0.0159 LM(2) : 1.61 (0.21)

$$\text{ecmPXS} = \ln(\text{PXSs}_a) - (0.239 * \ln(\text{PW_NONFs}_a(-1)) + 0.856 * \ln(\text{MUVs}_a(-1)) - 0.071 * \ln(\text{FX88}))$$

5.12.1 Export price deflator for services

$$\text{PXSs}_a = \text{PXSs}_a(-4) * ((\text{CPIs}_a / \text{FX88}) / (\text{CPIs}_a(-4) / \text{FX88}(-4)))$$

5.13 Import price deflator

$$\Delta \ln(\text{PMSs}_a) = 0.371 * \Delta \ln(\text{PW_NONFs}_a) - 0.079 * \Delta \ln(\text{DUBAs}_a(-2)) - 0.452 * \text{AR}(4) - 0.454 * \text{ecmPMS}(-1)$$

(3.57) (-2.04) (3.36) (-3.84)

Adjusted R-Squared = 0.40 S.E. of regression = 0.0294 LM(2) : 1.22 (0.31)

$$\text{ecmPMS} = \ln(\text{PMSs}_a) - (2.239 + 0.538 * \ln(\text{PW_NONFs}_a) + 0.064 * \ln(\text{DUBAs}_a))$$

5.13.1 Import price deflator for services

$$\text{PMSs}_a = \text{PMSs}_a(-4) * ((\text{CPIs}_a / \text{FX88}) / (\text{CPIs}_a(-4) / \text{FX88}(-4)))$$

5.14 GDP deflator

$$\text{PGDP} = \text{GDPN} / \text{GDPR} * 100$$

5.15 Inflation expectations

$$\text{CINFEX} = 0.25 * \text{CINFLAT}(-1) + 0.25 * \text{CINFLAT} + 0.50 * \text{CINFLAT}(4)$$

5.16 Housing Price Index

$$\ln(\text{PLANDTHs}_a) = -19.81 - 0.011 * (\text{MLR} - \text{CINFEX}) + 4.168 * \ln(\text{RENTs}_a) + 0.830 * \ln(\text{GDPRs}_a)$$

(-5.37) (-1.74) (5.59) (11.61)

Adjusted R-Squared = 0.93 S.E. of regression = 0.0150 LM(2) : 0.11 (0.90)

5.17 Rental Price Index

$$\Delta \ln(\text{RENTsa}) = 0.001 \cdot \Delta(\text{MLR}(-1) - \text{CINFEX}(-1)) + 0.774 \cdot \Delta \ln(\text{RENTsa}(-1))$$

(1.31) (6.69)

Adjusted R-Squared = 0.61 S.E. of regression = 0.0011 LM(2) : 2.84 (0.08)

6. Corporate Sector Model

6.1 Sales, cost of goods sold, profits

6.1.1 Sales

$$\ln(\text{SALESsa}) = -2.655 + 0.637 \cdot \ln(\text{GDPNsa}) - 0.020 \cdot (\text{MLR} - \text{CINFEX}) + 0.714 \cdot \ln(\text{SALESsa}(-1))$$

(-2.42) (2.78) (-3.98) (7.73)

Adjusted R-Squared = 0.99 S.E. of regression = 0.0444 LM(2) : 0.15 (0.86)

6.1.2 Cost of goods sold

$$\ln(\text{COGSsa}) = -1.733 + 0.937 \cdot \ln(\text{SALESsa}) + 0.400 \cdot \ln(\text{PPIsa})$$

(-3.45) (24.81) (2.59)

Adjusted R-Squared = 0.99 S.E. of regression = 0.0351 LM(2) : 0.48 (0.62)

6.1.3 Operating profits

$$\text{EBIT} = \text{SALES} - \text{COGS} - \text{OTHER}$$

6.1.4 Net profits

$$\text{NI} = \text{EBIT} - \text{INT} - \text{TAX} - \text{EXTRA}$$

6.2 Assets, equity, liabilities

6.2.1 Assets

$$\ln(\text{ASSETsa}) = 0.230 \cdot \ln(\text{GDPNsa}) + 0.832 \cdot \ln(\text{ASSETsa}(-1)) - 0.059 \cdot \ln(\text{FX88}(-1))$$

(5.62) (21.45) (-2.08)

Adjusted R-Squared = 0.98 S.E. of regression = 0.0336 LM(2) : 0.60 (0.55)

6.2.2 Equity

$$\Delta \ln(\text{EQUITYsa}) = 0.693 \cdot \Delta \ln(\text{GDPNsa}(-2)) - 0.619 \cdot \Delta \ln(\text{FX88}) + 0.001 \cdot \Delta(\text{NI}) + 0.038 \cdot \text{DUM01Q4} - 0.181 \cdot \text{ecmEQUITY}(-1)$$

(1.97) (-4.50) (7.11) (2.63) (-2.59)

Adjusted R-Squared = 0.62 S.E. of regression = 0.0545 LM(2) : 1.08 (0.35)

$$\text{ecmEQUITY} = \ln(\text{EQUITYsa}) - (1.635 \cdot \ln(\text{GDPNsa}) + 0.400 \cdot \text{DUM01Q4} + 0.016 \cdot (\text{MLR}(-1) - \text{FEDFUND}(-1)) - 1.041 \cdot \ln(\text{FX88}))$$

6.2.3 Liabilities

$$\text{DEBT} = \text{ASSET} - \text{EQUITY}$$

6.3 Debt burden and debt-service ability

6.3.1 Debt to equity ratio

$$\text{DE} = \text{DEBT} / \text{EQUITY}$$

6.3.2 Interest expenses

$$\ln(\text{INTsa}) = -6.837 + 1.304 \cdot \ln(\text{DEBTsa}(-1)) + 0.026 \cdot \text{MLR}(-1) - 0.436 \cdot \text{DUM01Q4}$$

6.3.3 Interest coverage ratio

$$\text{ICR} = \text{EBIT} / \text{INT}$$

7. Household Model

7.1 Liabilities

7.1.1 Banks' lending to household

$$\Delta \ln(\text{LOANHHTsa}) = -0.008 * \Delta \ln(\text{MLR}(-1)) + 0.332 * \Delta \ln(\text{CPRsa}(-4)) + 0.814 * \Delta \ln(\text{LOANHHTsa}(-1))$$

(-1.90) (2.39) (10.81)

Adjusted R-Squared = 0.68

S.E. of regression = 0.0177

LM(2) : 1.99 (0.15)

7.2 Debt Repayment Capacity

7.2.1 Household Interest Payments

$$\text{INTHH} = (\text{MLR} / 100) * \text{LOANHHT}$$

7.2.2 Ratio of Interest Payments to Income after Tax

$$\text{IGEARHH} = \text{INTHH} / (\text{GDPRsa} * (1 - \text{RH})) * 100$$

List of variables

Dependent variables

AVGEARN	Average earnings (baht/month)
BMCAP	Securities value (billion baht)
BPB, BPS	Balance of payments (billion baht, billion US dollars)
CAPITALB, CAPITALS	Capital and financial account (billion baht, billion US dollars)
CAPITALSPRI	Net flows of private financial account (billion US dollars)
CGOVR	Government consumption at 1988 constant prices (billion baht)
CINFEX	Inflation expectations
CLAIMG	Net claims on government (billion baht)
CORE, CINFLAT	Core consumer price index (CPI excluding raw food and energy prices) (2002 = 100), Core inflation (per cent)
CPI	Headline consumer price index (2002 = 100)
CPI94	Headline consumer price index (1994 = 100)
CPIEN	Energy price index (2002 = 100)
CPIRFOOD	Raw food price index (2002 = 100)
CPR	Total private consumption at 1988 constant prices (billion baht)
CPR1	Private durable goods consumption at 1988 constant prices (including transport equipment, electrical machinery, machinery and equipment, furniture, rubber products, and glass and plastic products) (billion baht)
CPR2	Private non-durable goods consumption at 1988 constant prices (including food products, beverages, energy, and services) (billion baht)
CURRENTB, CURRENTS	Current account balance (billion baht, billion US dollars)
DD	Domestic demand at 1988 constant prices (billion baht)
FARMPRICE	Farm price index (1995 = 100)
FARMPRICE_12	Farm price index (12 main products of Thailand) (1995 = 100)
FX	Exchange rate (baht/US dollar)
FX88	Exchange rate index (1988 = 100)
FX94	Exchange rate index (1994 = 100)
GCB	Government cash balance (billion baht)
GDPN	Gross domestic product at current market prices (billion baht)
GDPR	Gross domestic product at 1988 constant prices (billion baht)
GDPR_HSM	Gross domestic product trend at 1988 constant prices, estimated from Hodrick-Prescott and exponential smoothing methods (billion baht)
GREV	Government revenue (billion baht)
IPR	Private investment at 1988 constant prices (billion baht)
IPUB	Public investment at 1988 constant prices (billion baht)
M2A ^D , M2A ^S	Money supply (M2 + finance companies' promissory notes) (billion baht)
MGR	Imports of goods at 1988 constant prices (billion baht)
MLR	Minimum lending rate (per cent per annum)
MR	Imports of goods and services at 1988 constant prices (billion baht)
MSR	Imports of services at 1988 constant prices (billion baht)
NEER	Nominal effective exchange rate (1994 = 100)
NFA	Net foreign assets (billion baht)
OTHTIND	Other indirect taxes (billion baht)
PCREDIT	Claims on private sector (including securities holdings by the private sector) (billion baht)
PGCON	Government consumption deflator (1988 = 100)
PGDP	GDP deflator (1988 = 100)

PIFX	Public investment deflator (1988 = 100)
PIP	Private investment deflator (1988 = 100)
PLANDTH	Townhouse (including land) price index (1991 = 100)
PMS	Goods and services import price index (US dollars, 1988 = 100)
PMSS	Services import price index (US dollars, 1988 = 100)
PXS	Goods and services export price index (US dollars, 1988 = 100)
PXSS	Services export price index (US dollars, 1988 = 100)
RD3M	Three-month deposit rate (per cent per annum)
REER	Real effective exchange rate (1994 = 100)
RENT	Rental price index (2002 = 100)
RESERVE	International reserves (billion US dollars)
RISK	Exchange rate risk
RPII	Retail petroleum price index (1996 = 100)
TAXREV	Tax revenue (billion baht)
TC	Corporate income tax (billion baht)
TD	Direct tax (billion baht)
TEXC	Excise tax (billion baht)
TH	Personal income tax (billion baht)
TIND	Indirect tax (billion baht)
TVAT	Value added tax (billion baht)
WEALTH	Asset value (M2A and securities value) (billion baht)
XGR	Exports of goods at 1988 constant prices (billion baht)
XR	Exports of goods and services at 1988 constant prices (billion baht)
XSR	Exports of services at 1988 constant prices (billion baht)

Independent variables

CPIUS	Consumer price index of the United States (1990 = 100)
CGOVN	Government consumption at current prices (billion baht)
DUBAI	Dubai crude oil price (US dollars/barrel)
FARMPRICE_OTH	Other items of farm price index (1995 = 100)
FEDFUND	Federal funds rate (per cent per annum)
FINB	Government bond issuance for financial sector restructuring (billion baht)
GCAPITAL	Government capital expenditure (billion baht)
GCURRENT	Government current expenditure (billion baht)
IPUBN	Government investment at current prices (billion baht)
MINWAGE	Minimum wage (baht/day)
MUV	Manufacturing unit value index (2000 = 100)
NONBUDGET	Government non-budgetary balance (billion baht)
NPL	Non performing loans (billion baht)
OTHBP	Other items of balance of payments (billion baht)
OTHCAPS	Other items of capital and financial account (billion US dollars)
OTHGDP	Other items of gross domestic product at 1988 constant prices (billion baht)
OTHM2A	Other items of M2A (billion baht)
OTHNFA	Other items of net foreign assets (billion baht)
OTHREV	Non-tax revenue (billion baht)
PW_NONF	World non-fuel commodity price index (1995 = 100)
POTHGDP	Other items of gross domestic product deflator (1988 = 100)

RC	Corporate income tax rate (per cent)
REGIONFX	Regional exchange rate index (Japan, China, Singapore, Indonesia, Korea, the Philippines, Malaysia and Taiwan) (1994 = 100)
REXC	Excise tax rate (per cent)
RH	Personal income tax rate (per cent)
RMGR	Imports of goods to imports of goods and services ratio
RMSR	Imports of services to imports of goods and services ratio
ROTHTIND	Other indirect tax rate (per cent)
RP1D	1-day repurchase rate (per cent per annum)
RVAT	Value added tax rate (per cent)
RXGR	Exports of goods to exports of goods and services ratio
RXSR	Exports of services to exports of goods and services ratio
TPCPI	Trading partners consumer price index (Asian region economies, United States, Japan and euro area economies) (1994 = 100)
TPGDP	Trading partners gross domestic product index (Asian region economies, United States, Japan, euro area economies and United Kingdom) (2002 = 100)
WEN	Energy weight in CPI basket (proportion)
WFARMPRICE_12	Weight of 12 main products in farm price index basket (proportion)
WFARMPRICE_OTH	Weight of other items in farm price index basket (proportion)
WFP_12	World farm price index (12 main products of Thailand) (1995 = 100)
WRFOOD	Raw food weight in CPI basket (proportion)

Dummy variables

SALARY	represents periods where there were changes in the civil servants' salary structure, where 1994:Q4 and 2004:Q2 = 1, other = 0
OILCONTROL	represents periods where domestic retail oil prices were controlled, where 2004:Q1 - 2005:Q2 =1, other = 0

Corporate variables

ASSET	Assets (billion baht)
COGS	Cost of goods sold (billion baht)
DE	Debt to equity ratio (times)
DEBT	Liabilities (billion baht)
DUM01Q4	Represents debt restructuring period, where 2001 Q4 to present = 1, other = 0
EBIT	Profit (Loss) before interest and income tax expenses (billion baht)
EQUITY	Shareholders' equity (billion baht)
EXTRA	Other expenses (billion baht)
ICR	Interest coverage ratio (times)
INT	Interest expenses (billion baht)
NI	Net profit (loss) (billion baht)
OTHER	Other expenses (billion baht)
PPI	Producer price index (2000 = 100)
SALES	Revenue from sale of goods (billion baht)
TAX	Corporate income tax (unit: billion baht)

Household Model

LOANHHT	Banks' lending to households (billion baht)
INTHH	Interest payments (billion baht)
IGEARHH	Ratio of interest payments to income after tax (per cent)