

Appendix I

Recursive Solution To An Equation

$$d_t = (1+r)d_{t-1} - s_t$$

Rearranging the equation yields

$$d_{t-1} = (1+r)^{-1}d_t + (1+r)^{-1}s_t$$

In a same way, the expression for period t can be used and implied the following

$$d_t = (1+r)^{-1}d_{t+1} + (1+r)^{-1}s_{t+1}$$

And this is used to substitute D_t in the above equation to yield

$$d_{t-1} = (1+r)^{-1}(1+r)^{-1}d_{t+1} + (1+r)^{-1}s_t + (1+r)^{-2}s_{t+1}$$

The process is repeated for $D_{t+1}, D_{t+2}, D_{t+3}$ and so forth to yield

$$d_{t-1} = (1+r)^{-(j+1)}d_{t+j} + \sum_{i=0}^j (1+r)^{-(i+1)}s_{t+i}$$

In the limit, we derived the formula

$$d_{t-1} = -\sum_{j=0}^{\infty} \frac{s_{t+j}}{(1+r)^{t+j}} + \lim_{j \rightarrow \infty} \frac{d_{t+j}}{(1+r)^{t+j}}$$

Appendix II

Effect of Policy Coordination on Inflation

From the quantity theory of money, we have $\frac{M_t}{P_t} = \frac{y_t}{v}$ where v is the velocity of

money which is constant. If the assumption is that the money demand for

transactional purposes is stable, $y_t = y$, then $\frac{y_t}{v} = \frac{y}{v} = m$. Also, if we assumed

that money growth is constant at μ , inflation $\pi = \mu$. In this case the seigniorage

is also constant at $\delta_t = \delta$.

$$\delta = \frac{M_t - M_{t-1}}{P_t} = \frac{(1+\mu)M_{t-1} - M_{t-1}}{(1+\mu)P_{t-1}} = \frac{\mu}{1+\mu} m$$

If central bank is tough on inflation from period 0 to period T and give in thereafter and accept that it has to print more money to finance the deficit, the money growth rate will move from $\mu \rightarrow \mu'$.

The inflationary trend for period $t \geq 0$ and $s_t = s$ such that $s < rd_{t-1}$ can be solved as follows:-

Given that $\delta_t = \mu' m / (1 + \mu')$ for $t > T$ and $s_i = s$, the above equation can be restated as

$$d_r = \frac{s + \mu' m / (1 + \mu')}{r}$$

rearranging to obtain μ' gives us

$$\mu' = \frac{rd_T - s}{m - (rd_T - s)}$$

The derivative of the above gives

$$\frac{\partial \mu'}{\partial d_T} = \frac{rm}{[m - (rd_T - s)]^2} > 0$$

The result indicates that the higher the level of d_T , the higher the money supply growth rate μ' will be and the higher the inflation rate.

rolling (1) forward from 0 to T yields

$$d_{-1} = (1+r)^{-(T+1)} d_T + \sum_{t=0}^T (1+r)^{-(t+1)} (s_t + \delta_t)$$

rearranging the above yields

$$d_r = (1+r)^{T+1} d_{-1} - \frac{(1+r)^{T+1}}{r} \left(s + m \frac{\mu}{1+\mu} \right)$$

and the derivative of which

$$\frac{\partial d_T}{\partial T} = \ln(1+r)(1+r)^{T+1} [b_{-1} - \frac{1}{r}(s + m \frac{\mu}{1+\mu})]$$

if $\mu \rightarrow low$,

This suggests that if μ is low, the debt will accumulate faster.

Statistical Results of ADF Unit Root Test

Nominal Series

1. Federal Government Debt

a) 1970-1997

| | | | |
|--------------------|-----------|--------------------|---------|
| ADF Test Statistic | -1.403816 | 1% Critical Value* | -3.7076 |
| | | 5% Critical Value | -2.9798 |
| | | 10% Critical Value | -2.6290 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(DEBT97)
 Method: Least Squares
 Date: 10/16/04 Time: 15:11
 Sample(adjusted): 1972 1997
 Included observations: 26 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|----------|
| DEBT97(-1) | -0.019345 | 0.013780 | -1.403816 | 0.1737 |
| D(DEBT97(-1)) | 0.774378 | 0.126758 | 6.109121 | 0.0000 |
| C | 1726.310 | 982.6528 | 1.756786 | 0.0923 |
| R-squared | 0.635120 | Mean dependent var | | 3223.808 |
| Adjusted R-squared | 0.603391 | S.D. dependent var | | 3960.278 |
| S.E. of regression | 2494.060 | Akaike info criterion | | 18.58938 |
| Sum squared resid | 1.43E+08 | Schwarz criterion | | 18.73454 |
| Log likelihood | -238.6619 | F-statistic | | 20.01719 |
| Durbin-Watson stat | 2.023330 | Prob(F-statistic) | | 0.000009 |

b) 1998-2003

| | | | |
|--------------------|----------|--------------------|---------|
| ADF Test Statistic | 1.145556 | 1% Critical Value* | -3.7657 |
| | | 5% Critical Value | -3.0038 |
| | | 10% Critical Value | -2.6417 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation
 Dependent Variable: D(DEBTQ03)
 Method: Least Squares
 Date: 10/16/04 Time: 15:14
 Sample(adjusted): 1998:3 2003:4
 Included observations: 22 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|----------|
| DEBTQ03(-1) | 0.038515 | 0.033622 | 1.145556 | 0.2662 |
| D(DEBTQ03(-1)) | -0.294580 | 0.248541 | -1.185236 | 0.2505 |
| C | 704.8720 | 4175.540 | 0.168810 | 0.8677 |
| R-squared | 0.091062 | Mean dependent var | | 4445.864 |
| Adjusted R-squared | -0.004616 | S.D. dependent var | | 3970.059 |
| S.E. of regression | 3979.210 | Akaike info criterion | | 19.54168 |
| Sum squared resid | 3.01E+08 | Schwarz criterion | | 19.69046 |
| Log likelihood | -211.9585 | F-statistic | | 0.951759 |
| Durbin-Watson stat | 1.826903 | Prob(F-statistic) | | 0.403715 |

c) 1970-2003

| | | | |
|--------------------|----------|--------------------|---------|
| ADF Test Statistic | 0.904571 | 1% Critical Value* | -3.6496 |
| | | 5% Critical Value | -2.9558 |
| | | 10% Critical Value | -2.6164 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(DEBT03)

Method: Least Squares

Date: 10/16/04 Time: 15:00

Sample(adjusted): 1972 2003

Included observations: 32 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| DEBT03(-1) | 0.015849 | 0.017521 | 0.904571 | 0.3731 |
| D(DEBT03(-1)) | 0.892327 | 0.131964 | 6.761900 | 0.0000 |
| C | 199.3145 | 1217.094 | 0.163763 | 0.8711 |
| R-squared | 0.703542 | Mean dependent var | 5708.312 | |
| Adjusted R-squared | 0.683097 | S.D. dependent var | 6715.330 | |
| S.E. of regression | 3780.340 | Akaike info criterion | 19.40208 | |
| Sum squared resid | 4.14E+08 | Schwarz criterion | 19.53949 | |
| Log likelihood | -307.4332 | F-statistic | 34.41080 | |
| Durbin-Watson stat | 2.087390 | Prob(F-statistic) | 0.000000 | |

2. Federal Government Expenditure

a) 1970-1997

| | | | |
|--------------------|----------|--------------------|---------|
| ADF Test Statistic | 0.623268 | 1% Critical Value* | -3.7076 |
| | | 5% Critical Value | -2.9798 |
| | | 10% Critical Value | -2.6290 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EXPENSE97)

Method: Least Squares

Date: 10/16/04 Time: 15:32

Sample(adjusted): 1972 1997

Included observations: 26 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| EXPENSE97(-1) | 0.021401 | 0.034337 | 0.623268 | 0.5392 |
| D(EXPENSE97(-1)) | 0.367813 | 0.211598 | 1.738261 | 0.0955 |
| C | 871.4005 | 841.1613 | 1.036056 | 0.3109 |
| R-squared | 0.202531 | Mean dependent var | 2140.077 | |
| Adjusted R-squared | 0.133186 | S.D. dependent var | 2409.848 | |
| S.E. of regression | 2243.638 | Akaike info criterion | 18.37775 | |
| Sum squared resid | 1.16E+08 | Schwarz criterion | 18.52292 | |
| Log likelihood | -235.9108 | F-statistic | 2.920619 | |
| Durbin-Watson stat | 1.805876 | Prob(F-statistic) | 0.074082 | |

b) 1998-2003

| | | | |
|--------------------|-----------|--------------------|---------|
| ADF Test Statistic | -0.055075 | 1% Critical Value* | -3.7667 |
| | | 5% Critical Value | -3.0038 |
| | | 10% Critical Value | -2.6417 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EXPENSEQR98)

Method: Least Squares

Date: 10/16/04 Time: 15:34

Sample(adjusted): 1998:3 2003:4

Included observations: 22 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| EXPENSEQR98(-1) | -0.002357 | 0.042790 | -0.055075 | 0.9567 |
| D(EXPENSEQR98(-1)) | -0.065172 | 0.240196 | -0.271329 | 0.7891 |
| C | 697.3448 | 899.4227 | 0.775325 | 0.4477 |
| R-squared | 0.004622 | Mean dependent var | 606.0795 | |
| Adjusted R-squared | -0.100155 | S.D. dependent var | 875.2537 | |
| S.E. of regression | 918.0385 | Akaike info criterion | 16.60848 | |
| Sum squared resid | 16013099 | Schwarz criterion | 16.75726 | |
| Log likelihood | -179.6933 | F-statistic | 0.044110 | |
| Durbin-Watson stat | 1.969040 | Prob(F-statistic) | 0.956946 | |

c) 1970-2003

| | | | |
|--------------------|----------|--------------------|---------|
| ADF Test Statistic | 2.322529 | 1% Critical Value* | -3.6496 |
| | | 5% Critical Value | -2.9558 |
| | | 10% Critical Value | -2.6164 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(EXPENSE03)

Method: Least Squares

Date: 10/16/04 Time: 15:36

Sample(adjusted): 1972 2003

Included observations: 32 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| EXPENSE03(-1) | 0.067433 | 0.029034 | 2.322529 | 0.0274 |
| D(EXPENSE03(-1)) | 0.326766 | 0.197310 | 1.656103 | 0.1085 |
| C | 113.3113 | 873.9575 | 0.129653 | 0.8977 |
| R-squared | 0.493717 | Mean dependent var | 3445.750 | |
| Adjusted R-squared | 0.458801 | S.D. dependent var | 4074.663 | |
| S.E. of regression | 2997.575 | Akaike info criterion | 18.92805 | |
| Sum squared resid | 2.01E+08 | Schwarz criterion | 19.07547 | |
| Log likelihood | -300.0089 | F-statistic | 14.14013 | |
| Durbin-Watson stat | 1.810396 | Prob(F-statistic) | 0.000052 | |

3. Federal Government Revenue

a) 1970-1997

| | | | |
|--------------------|----------|--------------------|---------|
| ADF Test Statistic | 3.232312 | 1% Critical Value* | -3.7076 |
| | | 5% Critical Value | -2.9798 |
| | | 10% Critical Value | -2.6290 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(REV97)

Method: Least Squares

Date: 10/16/04 Time: 15:37

Sample(adjusted): 1972 1997

Included observations: 26 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| REV97(-1) | 0.108107 | 0.033446 | 3.232312 | 0.0037 |
| D(REV97(-1)) | -0.028197 | 0.232323 | -0.121372 | 0.9045 |
| C | 221.6863 | 623.7652 | 0.355400 | 0.7255 |
| R-squared | 0.460155 | Mean dependent var | 2435.308 | |
| Adjusted R-squared | 0.413212 | S.D. dependent var | 2479.982 | |
| S.E. of regression | 1899.717 | Akaike info criterion | 18.04496 | |
| Sum squared resid | 83005298 | Schwarz criterion | 18.19013 | |
| Log likelihood | -231.5845 | F-statistic | 9.802423 | |
| Durbin-Watson stat | 1.976561 | Prob(F-statistic) | 0.000834 | |

b) 1998-2003

| | | | |
|--------------------|-----------|--------------------|---------|
| ADF Test Statistic | -0.414121 | 1% Critical Value* | -3.7667 |
| | | 5% Critical Value | -3.0038 |
| | | 10% Critical Value | -2.6417 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(REVQR98)

Method: Least Squares

Date: 10/16/04 Time: 15:39

Sample(adjusted): 1998:3 2003:4

Included observations: 22 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| REVQR98(-1) | -0.118397 | 0.285900 | -0.414121 | 0.6834 |
| D(REVQR98(-1)) | -0.684612 | 0.228695 | -2.993561 | 0.0075 |
| C | 2635.519 | 4755.639 | 0.554188 | 0.5859 |
| R-squared | 0.484226 | Mean dependent var | 514.4545 | |
| Adjusted R-squared | 0.429934 | S.D. dependent var | 4408.373 | |
| S.E. of regression | 3328.443 | Akaike info criterion | 19.18452 | |
| Sum squared resid | 2.10E+08 | Schwarz criterion | 19.33330 | |
| Log likelihood | -208.0297 | F-statistic | 8.918907 | |
| Durbin-Watson stat | 1.600197 | Prob(F-statistic) | 0.001855 | |

c) 1970-2003

| | | | |
|--------------------|----------|--------------------|---------|
| ADF Test Statistic | 2.201783 | 1% Critical Value* | -3.6496 |
| | | 5% Critical Value | -2.9558 |
| | | 10% Critical Value | -2.6164 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(REV03)

Method: Least Squares

Date: 10/16/04 Time: 15:40

Sample(adjusted): 1972 2003

Included observations: 32 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| REV03(-1) | 0.076295 | 0.034652 | 2.201783 | 0.0358 |
| D(REV03(-1)) | -0.098979 | 0.200386 | -0.493942 | 0.6251 |
| C | 803.2398 | 1159.152 | 0.692955 | 0.4939 |
| R-squared | 0.152714 | Mean dependent var | 2824.562 | |
| Adjusted R-squared | 0.094280 | S.D. dependent var | 4263.210 | |
| S.E. of regression | 4057.268 | Akaike info criterion | 19.54347 | |
| Sum squared resid | 4.77E+08 | Schwarz criterion | 19.68088 | |
| Log likelihood | -309.6955 | F-statistic | 2.613457 | |
| Durbin-Watson stat | 1.992043 | Prob(F-statistic) | 0.090456 | |

4. Federal Government Surplus/Deficit

a) 1970-1997

| | | | |
|--------------------|-----------|--------------------|---------|
| ADF Test Statistic | -0.842610 | 1% Critical Value* | -3.7076 |
| | | 5% Critical Value | -2.9798 |
| | | 10% Critical Value | -2.6290 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(NOMIDEF97)

Method: Least Squares

Date: 10/16/04 Time: 15:43

Sample(adjusted): 1972 1997

Included observations: 26 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| NOMIDEF97(-1) | -0.121182 | 0.143817 | -0.842610 | 0.4081 |
| D(NOMIDEF97(-1)) | 0.243976 | 0.237653 | 1.026607 | 0.3153 |
| C | -67.49114 | 603.0534 | -0.111916 | 0.9119 |
| R-squared | 0.054252 | Mean dependent var | 295.2308 | |
| Adjusted R-squared | -0.027987 | S.D. dependent var | 2211.022 | |
| S.E. of regression | 2241.748 | Akaike info criterion | 18.37607 | |
| Sum squared resid | 1.16E+08 | Schwarz criterion | 18.52123 | |
| Log likelihood | -235.8889 | F-statistic | 0.659691 | |
| Durbin-Watson stat | 1.595733 | Prob(F-statistic) | 0.526521 | |

b) 1998-2003

| | | | |
|--------------------|-----------|--------------------|---------|
| ADF Test Statistic | -2.088061 | 1% Critical Value* | -3.7667 |
| | | 5% Critical Value | -3.0038 |
| | | 10% Critical Value | -2.6417 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(NOMIDEFQR98)

Method: Least Squares

Date: 10/16/04 Time: 15:45

Sample(adjusted): 1998:3 2003:4

Included observations: 22 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|-----------|
| NOMIDEFQR98(-1) | -0.208907 | 0.100048 | -2.088061 | 0.0505 |
| D(NOMIDEFQR98(-1)) | -0.081642 | 0.228735 | -0.356929 | 0.7251 |
| C | -1118.474 | 457.4345 | -2.445102 | 0.0244 |
| R-squared | 0.193801 | Mean dependent var | | -270.6136 |
| Adjusted R-squared | 0.108938 | S.D. dependent var | | 1130.596 |
| S.E. of regression | 1067.239 | Akaike info criterion | | 15.90966 |
| Sum squared resid | 21640966 | Schwarz criterion | | 17.05844 |
| Log likelihood | -183.0063 | F-statistic | | 2.283692 |
| Durbin-Watson stat | 1.935599 | Prob(F-statistic) | | 0.129182 |

c) 1970-2003

| | | | |
|--------------------|-----------|--------------------|---------|
| ADF Test Statistic | -0.850456 | 1% Critical Value* | -3.6496 |
| | | 5% Critical Value | -2.9558 |
| | | 10% Critical Value | -2.6164 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(NOMIDEF03)

Method: Least Squares

Date: 10/16/04 Time: 15:47

Sample(adjusted): 1972 2003

Included observations: 32 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|-----------|
| NOMIDEF03(-1) | -0.099971 | 0.117550 | -0.850456 | 0.4020 |
| D(NOMIDEF03(-1)) | 0.172377 | 0.207154 | 0.832121 | 0.4121 |
| C | -950.3503 | 781.5393 | -1.215998 | 0.2338 |
| R-squared | 0.032118 | Mean dependent var | | -621.1875 |
| Adjusted R-squared | -0.034633 | S.D. dependent var | | 3489.906 |
| S.E. of regression | 3549.824 | Akaike info criterion | | 19.27624 |
| Sum squared resid | 3.65E+08 | Schwarz criterion | | 19.41366 |
| Log likelihood | -305.4199 | F-statistic | | 0.481164 |
| Durbin-Watson stat | 2.068960 | Prob(F-statistic) | | 0.622910 |

Real Series

1. Federal Government Debt

a) 1970-1997

| | | | |
|--------------------|-----------|--------------------|---------|
| ADF Test Statistic | -1.625815 | 1% Critical Value* | -3.7076 |
| | | 5% Critical Value | -2.9798 |
| | | 10% Critical Value | -2.6290 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(REALDEBT97)

Method: Least Squares

Date: 10/16/04 Time: 17:27

Sample(adjusted): 1972 1997

Included observations: 26 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|----------|
| REALDEBT97(-1) | -0.031821 | 0.019573 | -1.625815 | 0.1176 |
| D(REALDEBT97(-1)) | 0.769002 | 0.125007 | 6.151653 | 0.0000 |
| C | 863.9399 | 523.1864 | 1.651304 | 0.1123 |
| R-squared | 0.656140 | Mean dependent var | | 856.9438 |
| Adjusted R-squared | 0.626239 | S.D. dependent var | | 1935.025 |
| S.E. of regression | 1182.996 | Akaike info criterion | | 17.09766 |
| Sum squared resid | 32188034 | Schwarz criterion | | 17.24282 |
| Log likelihood | -219.2695 | F-statistic | | 21.94386 |
| Durbin-Watson stat | 1.940219 | Prob(F-statistic) | | 0.000005 |

b) 1998-2003

| | | | |
|--------------------|----------|--------------------|---------|
| ADF Test Statistic | 1.048217 | 1% Critical Value* | -3.7667 |
| | | 5% Critical Value | -3.0038 |
| | | 10% Critical Value | -2.6417 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(REALDEBTQ98)

Method: Least Squares

Date: 10/16/04 Time: 17:26

Sample(adjusted): 1998:3 2003:4

Included observations: 22 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|----------|
| REALDEBTQ98(-1) | 0.044188 | 0.042155 | 1.048217 | 0.3077 |
| D(REALDEBTQ98(-1)) | -0.350838 | 0.234638 | -1.493956 | 0.1516 |
| C | -115.5365 | 1513.620 | -0.076331 | 0.9400 |
| R-squared | 0.116115 | Mean dependent var | | 1130.840 |
| Adjusted R-squared | 0.023075 | S.D. dependent var | | 1282.457 |
| S.E. of regression | 1267.574 | Akaike info criterion | | 17.25372 |
| Sum squared resid | 30528127 | Schwarz criterion | | 17.40250 |
| Log likelihood | -186.7909 | F-statistic | | 1.248011 |
| Durbin-Watson stat | 2.045735 | Prob(F-statistic) | | 0.309569 |

c) 1970-2003

| | | | |
|--------------------|-----------|--------------------|---------|
| ADF Test Statistic | -0.257882 | 1% Critical Value* | -3.6496 |
| | | 5% Critical Value | -2.9558 |
| | | 10% Critical Value | -2.6164 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(REALDEBT03)

Method: Least Squares

Date: 10/16/04 Time: 17:10

Sample(adjusted): 1972 2003

Included observations: 32 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| REALDEBT03(-1) | -0.005193 | 0.020138 | -0.257882 | 0.7983 |
| D(REALDEBT03(-1)) | 0.864699 | 0.121918 | 7.092440 | 0.0000 |
| C | 458.4945 | 561.2985 | 0.816846 | 0.4207 |
| R-squared | 0.636405 | Mean dependent var | 1426.281 | |
| Adjusted R-squared | 0.611329 | S.D. dependent var | 2212.894 | |
| S.E. of regression | 1379.595 | Akaike info criterion | 17.38603 | |
| Sum squared resid | 55195159 | Schwarz criterion | 17.52344 | |
| Log likelihood | -275.1764 | F-statistic | 25.37953 | |
| Durbin-Watson stat | 1.851123 | Prob(F-statistic) | 0.000000 | |

2. Federal Government Expenditure

a) 1970-1997

| | | | |
|--------------------|-----------|--------------------|---------|
| ADF Test Statistic | -0.598400 | 1% Critical Value* | -3.7076 |
| | | 5% Critical Value | -2.9798 |
| | | 10% Critical Value | -2.6290 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(REALEXP97)

Method: Least Squares

Date: 10/16/04 Time: 17:30

Sample(adjusted): 1972 1997

Included observations: 26 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| REALEXP97(-1) | -0.025876 | 0.043241 | -0.598400 | 0.5554 |
| D(REALEXP97(-1)) | 0.340356 | 0.199733 | 1.704059 | 0.1018 |
| C | 649.1786 | 475.0917 | 1.366428 | 0.1850 |
| R-squared | 0.115029 | Mean dependent var | 583.4787 | |
| Adjusted R-squared | 0.038075 | S.D. dependent var | 936.4927 | |
| S.E. of regression | 918.4911 | Akaike info criterion | 16.59151 | |
| Sum squared resid | 19403395 | Schwarz criterion | 16.73667 | |
| Log likelihood | -212.6896 | F-statistic | 1.494779 | |
| Durbin-Watson stat | 1.765000 | Prob(F-statistic) | 0.245292 | |

b) 1998-2003

| | | | |
|--------------------|-----------|--------------------|---------|
| ADF Test Statistic | -0.071816 | 1% Critical Value* | -3.7667 |
| | | 5% Critical Value | -3.0038 |
| | | 10% Critical Value | -2.6417 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(REALEXPQR98)

Method: Least Squares

Date: 10/16/04 Time: 17:31

Sample(adjusted): 1998:3 2003:4

Included observations: 22 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| REALEXPQR98(-1) | -0.003517 | 0.048975 | -0.071816 | 0.9435 |
| D(REALEXPQR98(-1)) | -0.113763 | 0.237722 | -0.478554 | 0.6377 |
| C | 187.7640 | 289.9947 | 0.647474 | 0.5251 |
| R-squared | 0.013662 | Mean dependent var | 148.8528 | |
| Adjusted R-squared | -0.090163 | S.D. dependent var | 252.5853 | |
| S.E. of regression | 263.7266 | Akaike info criterion | 14.11383 | |
| Sum squared resid | 1321483. | Schwarz criterion | 14.26261 | |
| Log likelihood | -152.2521 | F-statistic | 0.131586 | |
| Durbin-Watson stat | 2.005652 | Prob(F-statistic) | 0.877496 | |

c) 1970-2003

| | | | |
|--------------------|----------|--------------------|---------|
| ADF Test Statistic | 1.098485 | 1% Critical Value* | -3.6496 |
| | | 5% Critical Value | -2.9558 |
| | | 10% Critical Value | -2.6164 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(REALEXP03)

Method: Least Squares

Date: 10/16/04 Time: 17:34

Sample(adjusted): 1972 2003

Included observations: 32 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| REALEXP03(-1) | 0.037831 | 0.034439 | 1.098485 | 0.2810 |
| D(REALEXP03(-1)) | 0.370468 | 0.188199 | 1.968492 | 0.0586 |
| C | 89.17059 | 434.0178 | 0.205454 | 0.8387 |
| R-squared | 0.238778 | Mean dependent var | 865.6075 | |
| Adjusted R-squared | 0.185279 | S.D. dependent var | 1224.221 | |
| S.E. of regression | 1104.326 | Akaike info criterion | 15.94092 | |
| Sum squared resid | 35306570 | Schwarz criterion | 17.07833 | |
| Log likelihood | -268.0547 | F-statistic | 4.5483C8 | |
| Durbin-Watson stat | 1.756631 | Prob(F-statistic) | 0.019139 | |

3. Federal Government Revenue

a) 1970-1997

| | | | |
|--------------------|----------|--------------------|---------|
| ADF Test Statistic | 1.823306 | 1% Critical Value* | -3.7076 |
| | | 5% Critical Value | -2.9798 |
| | | 10% Critical Value | -2.6290 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(REALREV97)

Method: Least Squares

Date: 10/16/04 Time: 17:35

Sample(adjusted): 1972 1997

Included observations: 26 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|----------|
| REALREV97(-1) | 0.062002 | 0.034005 | 1.823306 | 0.0813 |
| D(REALREV97(-1)) | -0.000952 | 0.224371 | -0.004244 | 0.9057 |
| C | 155.0653 | 299.9169 | 0.517028 | 0.6101 |
| R-squared | 0.155933 | Mean dependent var | | 702.3339 |
| Adjusted R-squared | 0.082536 | S.D. dependent var | | 742.6269 |
| S.E. of regression | 711.3204 | Akaike info criterion | | 16.08029 |
| Sum squared resid | 11637466 | Schwarz criterion | | 16.22545 |
| Log likelihood | -206.0438 | F-statistic | | 2.124506 |
| Durbin-Watson stat | 1.969876 | Prob(F-statistic) | | 0.142343 |

b) 1998-2003

| | | | |
|--------------------|----------|--------------------|---------|
| ADF Test Statistic | 0.136605 | 1% Critical Value* | -3.7667 |
| | | 5% Critical Value | -3.0038 |
| | | 10% Critical Value | -2.6417 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(REALREVQR98)

Method: Least Squares

Date: 10/16/04 Time: 17:36

Sample(adjusted): 1998:3 2003:4

Included observations: 22 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|----------|
| REALREVQR98(-1) | 0.010023 | 0.073371 | 0.136605 | 0.8928 |
| D(REALREVQR98(-1)) | 0.431741 | 0.238724 | 1.808537 | 0.0864 |
| C | 6.154325 | 355.0648 | 0.017333 | 0.9864 |
| R-squared | 0.169340 | Mean dependent var | | 74.11402 |
| Adjusted R-squared | 0.081902 | S.D. dependent var | | 224.3645 |
| S.E. of regression | 214.9804 | Akaike info criterion | | 13.70509 |
| Sum squared resid | 878114.6 | Schwarz criterion | | 13.85387 |
| Log likelihood | -147.7560 | F-statistic | | 1.936686 |
| Durbin-Watson stat | 1.998671 | Prob(F-statistic) | | 0.171602 |

c) 1970-2003

| | | | |
|--------------------|----------|--------------------|---------|
| ADF Test Statistic | 0.793558 | 1% Critical Value* | -3.6496 |
| | | 5% Critical Value | -2.9558 |
| | | 10% Critical Value | -2.6164 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(REALREV03)

Method: Least Squares

Date: 10/16/04 Time: 17:38

Sample(adjusted): 1972 2003

Included observations: 32 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| REALREV03(-1) | 0.032361 | 0.040779 | 0.793558 | 0.4339 |
| D(REALREV03(-1)) | -0.048957 | 0.195885 | -0.249928 | 0.8044 |
| C | 399.2732 | 484.3713 | 0.824312 | 0.4165 |
| R-squared | 0.021267 | Mean dependent var | 718.7571 | |
| Adjusted R-squared | -0.046231 | S.D. dependent var | 1300.535 | |
| S.E. of regression | 1330.258 | Akaike info criterion | 17.31319 | |
| Sum squared resid | 51318008 | Schwarz criterion | 17.45061 | |
| Log likelihood | -274.0111 | F-statistic | 0.315078 | |
| Durbin-Watson stat | 1.976984 | Prob(F-statistic) | 0.732198 | |

4. Federal Government Surplus/Deficit

a) 1970-1997

| | | | |
|--------------------|-----------|--------------------|---------|
| ADF Test Statistic | -1.196438 | 1% Critical Value* | -3.7076 |
| | | 5% Critical Value | -2.9798 |
| | | 10% Critical Value | -2.6290 |

*MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(REALDEF97)

Method: Least Squares

Date: 10/16/04 Time: 17:39

Sample(adjusted): 1972 1997

Included observations: 26 after adjusting endpoints

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|--------|
| REALDEF97(-1) | -0.164122 | 0.137175 | -1.196438 | 0.2437 |
| D(REALDEF97(-1)) | 0.305447 | 0.220501 | 1.385244 | 0.1793 |
| C | -134.2965 | 274.3998 | -0.489419 | 0.6292 |
| R-squared | 0.037253 | Mean dependent var | 118.8552 | |
| Adjusted R-squared | 0.018753 | S.D. dependent var | 940.9143 | |
| S.E. of regression | 932.0505 | Akaike info criterion | 16.62082 | |
| Sum squared resid | 19980515 | Schwarz criterion | 16.76598 | |
| Log likelihood | -213.0706 | F-statistic | 1.238895 | |
| Durbin-Watson stat | 1.591251 | Prob(F-statistic) | 0.308326 | |

Statistical Results of Johansen Co-integration Test

Nominal Series

a) 1970-1997

Date: 10/16/04 Time: 17:53

Sample: 1970 1997

Included observations: 26

Test assumption: Linear deterministic trend in the data

Series: EXPENSE97 REV97

Lags interval: 1 to 1

| Eigenvalue | Likelihood Ratio | 5 Percent Critical Value | 1 Percent Critical Value | Hypothesized No. of CE(s) |
|------------|------------------|--------------------------|--------------------------|---------------------------|
| 0.349862 | 15.72511 | 15.41 | 20.04 | None * |
| 0.159906 | 4.530290 | 3.76 | 6.65 | At most 1 * |

(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. test indicates 2 cointegrating equation(s) at 5% significance level

Unnormalized Cointegrating Coefficients:

| | | |
|-----------|----------|--|
| EXPENSE97 | REV97 | |
| -6.50E-06 | 2.39E-05 | |
| -7.06E-05 | 6.69E-05 | |

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

| | | |
|----------------|------------------------|----------|
| EXPENSE97 | REV97 | C |
| 1.000000 | -3.676405 (7.91595) | 53486.83 |
| Log likelihood | -462.5733 | |

b) 1998-2003

Date: 10/16/04 Time: 18:01

Sample: 1998:1 2003:4

Included observations: 22

Test assumption: Linear deterministic trend in the data

Series: EXPENSEQR98 REVQR98

Lags interval: 1 to 1

| Eigenvalue | Likelihood Ratio | 5 Percent Critical Value | 1 Percent Critical Value | Hypothesized No. of CE(s) |
|------------|------------------|--------------------------|--------------------------|---------------------------|
| 0.366791 | 10.10753 | 15.41 | 20.04 | None |
| 0.002476 | 0.054533 | 3.76 | 6.65 | At most 1 |

(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. rejects any cointegration at 5% significance level

Unnormalized Cointegrating Coefficients:

| | | |
|-------------|----------|--|
| EXPENSEQR98 | REVQR98 | |
| -6.69E-05 | 0.000108 | |
| 1.38E-05 | 6.58E-05 | |

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

| | | |
|----------------|------------------------|----------|
| EXPENSEQR98 | REVQR98 | C |
| 1.000000 | -1.613769 (0.36885) | 5689.373 |
| Log likelihood | -381.9701 | |

c) 1970-2003

Date: 10/16/04 Time: 18:03

Sample: 1970 2003

Included observations: 32

Test assumption: Linear deterministic trend in the data

Series: EXPENSE03 REV03

Lags interval: 1 to 1

| Eigenvalue | Likelihood Ratio | 5 Percent Critical Value | 1 Percent Critical Value | Hypothesized No. of CE(s) |
|------------|------------------|--------------------------|--------------------------|---------------------------|
| 0.200158 | 9.631304 | 15.41 | 20.04 | None |
| 0.074700 | 2.484387 | 3.76 | 6.65 | At most 1 |

(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. rejects any cointegration at 5% significance level

Unnormalized Cointegrating Coefficients:

| | | |
|-----------|----------|---|
| EXPENSE03 | REV03 | C |
| -3.42E-06 | 1.35E-05 | |
| -3.72E-05 | 3.64E-05 | |

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

| | | |
|----------------|-----------|----------|
| EXPENSE03 | REV03 | C |
| 1.000000 | -3.942641 | 83279.19 |
| | (11.3773) | |
| Log likelihood | -599.6902 | |

Real Series

Sample: 1970 1997

a) 1970-1997

Series: REALEXP97 REALREV97

Included observations: 26

Test assumption: Linear deterministic trend in the data

Series: REALEXP97 REALREV97

Lags interval: 1 to 1

| Eigenvalue | Likelihood Ratio | 5 Percent Critical Value | 1 Percent Critical Value | Hypothesized No. of CE(s) |
|------------|------------------|--------------------------|--------------------------|---------------------------|
| 0.217323 | 11.22031 | 15.41 | 20.04 | None |
| 0.170154 | 4.849403 | 3.76 | 6.65 | At most 1 * |

(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. rejects any cointegration at 5% significance level

Unnormalized Cointegrating Coefficients:

| | | |
|-----------|-----------|---|
| REALEXP97 | REALREV97 | C |
| 8.77E-05 | -4.04E-05 | |
| -0.000143 | 0.000157 | |

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

| | | |
|----------------|-----------|-----------|
| REALEXP97 | REALREV97 | C |
| 1.000000 | -0.460378 | -6235.540 |
| | (0.38760) | |
| Log likelihood | -413.6692 | |

b) 1998-2003

Date: 10/16/04 Time: 18:11

Sample: 1998:1 2003:4

Included observations: 22

Test assumption: Linear deterministic trend in the data

Series: REALEXPQR98 REALREVQR98

Lags interval: 1 to 1

| Eigenvalue | Likelihood Ratio | 5 Percent Critical Value | 1 Percent Critical Value | Hypothesized No. of CE(s) |
|------------|------------------|--------------------------|--------------------------|---------------------------|
| 0.401188 | 11.36877 | 15.41 | 20.04 | None |
| 0.003947 | 0.086999 | 3.76 | 6.65 | At most 1 |

(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. rejects any cointegration at 5% significance level

Unnormalized Cointegrating Coefficients:

| REALEXPQR98 | REALREVQR98 |
|-------------|-------------|
| -0.000527 | 0.000815 |
| -3.27E-05 | 0.000393 |

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

| REALEXPQR98 | REALREVQR98 | C |
|-------------|------------------------|----------|
| 1.000000 | -1.547156 (0.16912) | 1561.572 |

Log likelihood -292.5215

c) 1970-2003

Date: 10/16/04 Time: 18:14

Sample: 1970 2003

Included observations: 32

Test assumption: Linear deterministic trend in the data

Series: REALEXP03 REALREV03

Lags interval: 1 to 1

| Eigenvalue | Likelihood Ratio | 5 Percent Critical Value | 1 Percent Critical Value | Hypothesized No. of CE(s) |
|------------|------------------|--------------------------|--------------------------|---------------------------|
| 0.129417 | 5.941470 | 15.41 | 20.04 | None |
| 0.045987 | 1.506512 | 3.76 | 6.65 | At most 1 |

(**) denotes rejection of the hypothesis at 5%(1%) significance level

L.R. rejects any cointegration at 5% significance level

Unnormalized Cointegrating Coefficients:

| REALEXP03 | REALREV03 |
|-----------|-----------|
| -9.89E-05 | 0.000109 |
| 4.13E-05 | -1.10E-05 |

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

| REALEXP03 | REALREV03 | C |
|-----------|------------------------|-----------|
| 1.000000 | -1.103542 (0.16045) | -648.0539 |

Log likelihood -534.1076