1. **Nardl equations for long run relation ship :**

GDP = f ( EXPN , TAX , TB , UM )

$$∆GDP \_{t}= α+ β\_{0}GDP\_{t-1}+ β\_{1}TB\_{t-1}+β\_{2}UM\_{t-1}+β\_{3}EXPN\_{t-1}^{+}+β\_{4}EXPN\_{t-1}^{-}+β\_{5}TAX\_{t-1}^{+}+β\_{6}TAX\_{t-1}^{-}+\sum\_{i=1}^{P} γi∆ GDP\_{it-i}+\sum\_{i=1}^{q}δ\_{i}∆TB\_{it-i}+\sum\_{i=1}^{s}λ\_{i}UM\_{it-i}+\sum\_{i=1}^{m}γ\_{1i}\left(a\_{i}^{+}∆EXPN\_{t-i}^{+}+a\_{i}^{-}∆EXPN\_{t-i}^{-}\right)+\sum\_{i=1}^{L}ψ\_{i}\left(b\_{i}^{+}∆TAX\_{t-i}^{+}+b\_{i}^{-}∆TAX \_{t-i}^{-}\right)+ ε\_{t}$$

1. Nardl estimation:

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| --- | --- | --- | --- | --- |
| Table 01 : nardl equation |  |  |  |  |
|  |  |  |  |  |
| Variable | Coefficient | Std. Error | t-Statistic | Prob.\*   |
|  |  |  |  |  |
|  |  |  |  |  |
| C | 1.938257 | 3.798304 | 0.510295 | 0.6164 |
| GDP(-1) | 1.429057 | 0.262701 | 5.439853 | 0.0000 |
| UM(-1) | -0.181626 | 0.146478 | -1.239951 | 0.2318 |
| TB(-1) | 0.019616 | 0.042995 | 0.456240 | 0.6540 |
| EXPN\_P(-1) | -0.397409 | 0.191455 | -2.075729 | 0.0534 |
| EXPN\_N(-1) | 0.227362 | 0.134056 | 1.696025 | 0.1081 |
| TAXES\_P(-1) | 0.227672 | 0.100020 | 2.276256 | 0.0361 |
| TAXES\_N(-1) | -0.081982 | 0.069340 | -1.182311 | 0.2534 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.661081 |     Mean dependent var | 0.118520 |
| Adjusted R-squared | 0.521526 |     S.D. dependent var | 2.299267 |
| S.E. of regression | 1.590444 |     Akaike info criterion | 4.020242 |
| Sum squared resid | 43.00173 |     Schwarz criterion | 4.410282 |
| Log likelihood | -42.25302 |     Hannan-Quinn criter. | 4.128422 |
| F-statistic | 4.737072 |     Durbin-Watson stat | 2.400275 |
| Prob(F-statistic) | 0.004152 |  |  |  |
|  |  |  |  |  |
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1. Co-integration for non linear equation

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| Wald Test: |  |  |
| Equation: Nardl |  |
|  |  |  |  |
|  |  |  |  |
| Test Statistic | Value | df | Probability |
|  |  |  |  |
|  |  |  |  |
| F-statistic |  4.737072 | (7, 17) |  0.0042 |
| Chi-square |  33.15950 |  7 |  0.0000 |
|  |  |  |  |
|  |  |  |  |

1. Bond test for linear equation  ( shin et al)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
| Test Statistic | Value | k |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| F-statistic |  2.184939 | 4 |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Critical Value Bounds |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Significance | I0 Bound | I1 Bound |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| 10% | 2.45 | 3.52 |  |  |
| 5% | 2.86 | 4.01 |  |  |
| 2.5% | 3.25 | 4.49 |  |  |
| 1% | 3.74 | 5.06 |  |  |
|  |  |  |  |  |
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1. Assymetric co-integration

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| --- | --- | --- |
| Ramsey RESET Test |  |  |
| Equation: NARDL |  |  |
| Specification: DGDP(-1) C GDP(-1) UM(-1) TB(-1) EXPN\_P(-1) |
|         EXPN\_N(-1) TAXES\_P(-1) TAXES\_N(-1) |
| Omitted Variables: Squares of fitted values |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Value | df | Probability |  |
| t-statistic |  2.124515 |  16 |  0.0496 |  |
| F-statistic |  4.513566 | (1, 16) |  0.0496 |  |
| Likelihood ratio |  6.212442 |  1 |  0.0127 |  |
|  |  |  |  |  |
|  |  |  |  |  |
| F-test summary: |  |  |
|  | Sum of Sq. | df | Mean Squares |  |
| Test SSR |  9.461599 |  1 |  9.461599 |  |
| Restricted SSR |  43.00173 |  17 |  2.529513 |  |
| Unrestricted SSR |  33.54013 |  16 |  2.096258 |  |
|  |  |  |  |  |
|  |  |  |  |  |
| LR test summary: |  |  |
|  | Value | df |  |  |
| Restricted LogL | -42.25302 |  17 |  |  |
| Unrestricted LogL | -39.14680 |  16 |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
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