Journal of Applied Economics and Business

OPEN ACCESS ARTICLE

# MODEL FOR GROSS OPERATING SURPLUS AND MIXED INCOME AT CURRENT PRICES IN 25 EU COUNTRIES

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***Abstract***

It is remarkable that high profits do not make an economy more resilient. Gross operating surplus is equal to profits, interest and rents before tax plus income of the self-employed. Ireland had the highest rate of the EU, while Germany had one of the lowest. This metric is influenced by the structure of an economy. In this study, we consider and estimate the most accurate association model for the gross operating surplus and mixed income at current prices in 25 EU countries for the period of 1998-2008 (shortly before the rise of economic crises in mid-July). The data used for the study were obtained from the Eurostat. The programme of the Categorical Data Analysis System (CDAS) is used in order to ascertain the results. The Analysis of Association (ANOAS) table is given in order to find the percentage of the data, which is covered by each model. We analyze and estimate the association model with the best fit. Finally, it is concluded that all six association models show an acceptable fit especially the third model (row effects), which gives the best fit by covering about 59% of the data.

***Key words***

Association models; Log-linear and log-nonlinear models; Gross operating surplus; Mixed income; Current prices; European Union.

## INTRODUCTION

In the national accounts, gross operating surplus (GOS) is the portion of income derived from production by incorporated enterprises that is earned by the capital factor, i.e. before account has been taken of the interest, rents or charges paid or received for the use of assets. It is calculated as a balancing item in the generation of income account of the national accounts. It differs from profits shown in company accounts for several reasons. Only a subset of total costs is subtracted from gross output to calculate the GOS. Essentially GOS is gross output *less* the cost of intermediate goods and services (to give gross value added), and *less* compensation of employees. It is *gross* because it makes no allowance for depreciation of capital according to Fairbanks (2000).

A similar concept for unincorporated enterprises (e.g. small family businesses like farms and retail shops or self-employed taxi drivers, lawyers and health professionals) is gross mixed income. Since in most such cases it is difficult to distinguish between income from labor and income from capital, the balancing item in the generation of income account is "mixed" by including both, the remuneration of the capital and labor (of the family members and self-employed) used in production. In other words, mixed income is the remuneration for the work carried out by the owner (or by members of his family) of an unincorporated enterprise. This is referred to as 'mixed income' since it cannot be distinguished from the entrepreneurial profit of the owner. Gross operating surplus and gross mixed income are used to calculate GDP using the income method (Eurostat /JP, 2008).

TABLE 1. GROSS OPERATING SURPLUS AND MIXED INCOME AT CURRENT PRICES IN EU 25 (% OF GDP)

| Geo / Time | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Belgium | 37.8 | 37.3 | 37.2 | 37.4 | 36.4 | 37 | 36.1 | 35.9 | 36.4 | 37.3 | 37.3 |
| Czech Republic | 47.6 | 46.5 | 47.2 | 49.8 | 49.6 | 49.5 | 49.5 | 48.2 | 47.7 | 47 | 47.3 |
| Denmark | 34.5 | 33.9 | 33.6 | 31.4 | 31.3 | 33.2 | 31.9 | 31.4 | 31.2 | 31.4 | 32.3 |
| Germany | 36.4 | 36.7 | 37.4 | 37.5 | 36.8 | 36.1 | 36.5 | 37 | 37.1 | 38 | 38.9 |
| Estonia | 33 | 36.8 | 37.2 | 40.1 | 38.6 | 43.1 | 43.9 | 44.1 | 42.5 | 42.4 | 42.4 |
| Ireland | 43.8 | 44.6 | 45.9 | 48.4 | 48.2 | 49 | 49.7 | 50.8 | 50.1 | 48 | 47.5 |
| Greece | 57.1 | 56.8 | 55.4 | 54.8 | 52.9 | 54 | 54.2 | 54.4 | 55.4 | 54.7 | 54.8 |
| Spain | 42.6 | 42.3 | 41.3 | 41.1 | 40.6 | 40.5 | 41.2 | 41.6 | 41.6 | 41.8 | 42.1 |
| France | 34.5 | 34 | 34.2 | 34.6 | 33.9 | 34.4 | 34.6 | 34.3 | 34.4 | 34.4 | 34 |
| Italy | 48.2 | 48.3 | 47.4 | 46.4 | 46.5 | 47.2 | 47.4 | 47.1 | 47 | 47.1 | 46 |
| Cyprus | 46 | 46 | 45.7 | 46.9 | 47.3 | 47 | 46.7 | 44.3 | 40.2 | 39.7 | 39.1 |
| Latvia | 43.1 | 41.7 | 43 | 42.3 | 44 | 47.3 | 49.2 | 51 | 49.1 | 49.5 | 46.7 |
| Lithuania | 50 | 50.4 | 48 | 45.4 | 44.2 | 48.7 | 50.5 | 49.8 | 49.9 | 49.8 | 50.2 |
| Luxembourg-GrandDuché | 42.8 | 43.1 | 41.2 | 41 | 42.5 | 41.4 | 38.9 | 39.4 | 40.8 | 39.3 | 40.4 |
| Hungary | 37.3 | 39.1 | 40.8 | 41 | 41.9 | 42.4 | 41.5 | 41.5 | 40.1 | 39.8 | 40 |
| Malta | 45.4 | 44.8 | 44.8 | 45.4 | 44.3 | 45 | 41.7 | 42.3 | 41.9 | 39.9 | 40.8 |
| Netherlands | 38.8 | 39 | 39.4 | 38.7 | 38 | 38.6 | 38 | 37.8 | 37.5 | 37.7 | 38.5 |
| Austria | 34.9 | 35.7 | 35.6 | 36.1 | 36 | 37.2 | 37.8 | 37.9 | 38.5 | 39.5 | 40 |
| Poland | 47 | 45.6 | 45.2 | 45.6 | 45.5 | 47.6 | 46.9 | 48 | 48.9 | 51.9 | 51.1 |
| Portugal | 37.8 | 37.6 | 37.4 | 37.2 | 38.4 | 37.6 | 38 | 37.4 | 37.2 | 37.1 | 37.5 |
| Slovenia | 29.4 | 30.3 | 32.5 | 32.9 | 33.8 | 32.3 | 32 | 32.2 | 33.3 | 33.6 | 33.4 |
| Slovakia | 47.7 | 47.9 | 48 | 46.2 | 48.1 | 48.5 | 50.2 | 49.3 | 50.2 | 52 | 52 |
| Finland | 39.5 | 38.4 | 39.1 | 39.8 | 39.8 | 41 | 41 | 40.7 | 39.4 | 39.8 | 38.6 |
| Sweden | 35.5 | 32.5 | 32.2 | 31 | 30.7 | 30 | 27.9 | 27.8 | 27.9 | 28.8 | 29.1 |
| United Kingdom | 33.4 | 34.5 | 34.1 | 32.9 | 31.9 | 30.7 | 30.3 | 31.1 | 31.7 | 32.2 | 31.6 |

*Source:* Eurostat/JP: Economic and Social Research Institute

## METHODOLOGY

### Association models

We consider six of the most commonly used Association Model of the Categorical Data Analysis. These are:

1. The Null Association or Independence Model which holds that there is no relationship between the variables and it is also symbolized with (O). The log-linear model is: Log ($F_{ij}$) = $\lambda+\lambda_{A(i)}+\lambda_{B(j)}$ , where log denotes to the natural logarithm, $F_{ij}$ are the expected frequencies under the Independence Model, $\lambda_{A(i)}$ are the rows main effects and $\lambda_{B(j)}$ are the columns main effects (Goodman, 1979a).

2. The Uniform Association Model, which is symbolized with (U) in log-linear form is log($F_{ij}$)=$\lambda+\lambda_{A(i)}+\lambda_{B(j)}+\phi\chi_i y_j$ , where $\phi$ ιs a single parameter for interaction and $\chi_i$ ,$y_j$ are the scores for the row and column variables (i =1,…,I, j =1,…,J) respectively.

3. The Row-Effects Association Model (R) where linear interaction holds: log ($F_{ij}$) =$\lambda+\lambda_{A(i)}+\lambda_{B(j)}+\phi\mu_I y_j$, where $y_j$ are fixed scores for the column variable (j = 1,…, J) and $\mu_I$ are unknown scores for the row variable (I=1,…,I).

4. The Column-Effects Association Model (C) is the same as the Row-Effects Association Model with a change in subscripts: Log($F_{ij}$) = $\lambda+\lambda_{A(i)}+\lambda_{B(j)}+\phi\nu_j x_I$ , where $x_I$ are fixed scores for the row variable (i =1,…,I) and $\nu_j$ are unknown scores for the column variable (j =1,…,J).

5. The model whereby we have both row and column effects in additive form is called the Row + Column Effects Association Model (R+C) or Model 1, (Goodman, 1981a). The log-frequency version of the above model is: log($F_{ij}$) = $\lambda+\lambda_{A(i)}+\lambda_{B(j)}+\sum_{\kappa=1}^{I-1}\beta_\kappa y_j Z_{A(\kappa)}+\sum_{\kappa=1}^{J-1}\gamma_\kappa x_i Z_{B(\kappa)}$ , where $\chi_i$ ,$y_j$ are the scores as defined earlier, and $Z_{A(i)}$, $Z_{B(j)}$ denotes to indicators of variable indices (or dummy variables) for the levels of row and column effects respectively.

6. The model, instead of additive row and column effects on the local odds ratios has multiplicative effects called the Row Column Effects Association Model (RC) or Model II, (Goodman, 1981b). The log-multiplicative model is: log ($F_{ij}$) = $\lambda+\lambda_{A(i)}+\lambda_{B(j)}+\phi\mu_I\nu_j$, where the row score parameters $\mu_I$ and column score parameters $\nu_j$ are not known, but those estimated from the data.

We aim at finding the model (out of the six) that best fit from the other models which we are examining, i.e., the Gross operating surplus and mixed income at current prices in 25 EU countries for the period of 1998-2008. For this reason, we are going to examine first the Index of Dissimilarity (L2), which shows that, the lesser the number, the more our model will give the best fit to match the Gross operating surplus and mixed income at current prices in each country of the 25 EU countries compared with other models under consideration.

TABLE 2. MODELS ANALYSIS

| Models | Likelihood $X^2$ | (Likelihood) $G^2$ | Degrees of Freedom | Index of Dissimilarity | Final Iteration | Maximum Deviation |
|---|---|---|---|---|---|---|
| O | 18.90549 | 19.00388 | 240 | 0.01529 | 3 | 0.00000000 |
| U | 18.84812 | 18.94400 | 239 | 0.01533 | 3 | 0.00002467 |
| R | 7.86083 | 7.87497 | 216 | 0.01020 | 4 | 0.00001106 |
| C | 18.46532 | 18.56803 | 230 | 0.01541 | 3 | 0.00010623 |
| R+C | 7.49085 | 7.50546 | 207 | 0.01006 | 4 | 0.00001253 |
| RC | 7.03765 | 7.04663 | 207 | 0.00958 | 420 | 0.00099770 |

## MODELS ANALYSIS

We analyze the six association models used in the data described in Table 1, with the help of the statistics package of the Categorical Data Analysis in accordance with Scott and Clogg (1990). We used the Pearson chi-squared ($X^2$) statistic, the likelihood-ratio chi-square ($G^2$) statistic, and the index of dissimilarity $D = \sum_{ij} \left| f_{ij}/n - F_{ij}/n \right| / 2$ (where $f_{ij}$ the observed frequencies and $F_{ij}$ the expected frequencies (under the model) and we have the following results below:

TABLE 3. INDEX OF DISSIMILARITY

| | |
|---|---|
| 1. Null Association-Independence Model (O) | 0.01529 |
| 2. Uniform Association Model (U) | 0.01533 |
| 3. Row-Effects Association Model (R) | 0.01020 |
| 4. Column-Effects Association Model (C) | 0.01541 |
| 5. Row+Columns Effects Association Model (R+C) | 0.01006 |
| 6. Row Column Effects Association Model (RC) | 0.00958 |

At first sight it seems that the row-column model (RC) adjusted better to the gross operating surplus and mixed income in the years under study, as it is the one that has the lowest index of dissimilarity with D = 0.00958.

Diewert, (1995 and 1996) further stated that we can prove this in another way through the calculation of Indicator BIC (Bayes Information Criterion). The formula for this calculation is:

$BIC = G^2 - (D.F.) \, Log(n)$

Symbols:
n = the size of the sample
d.f. = degrees of freedom of the models
$G^2$ = the likelihood-ratio chi-square statistics

When comparing a number of models, the model with the smallest value of BIC is regarded as the best. So, we choose the models whereby the INDEX OF DISSIMILARITY are similar and the lowest out of the six models. However, since we have models with similar lower ratio, to justify which model give the best fit to match the both Countries and Years, the calculation of the Index BIC (Bayes information criterion) gives the solution. More precisely, the 3rd, 5th and 6th model. Therefore, we see:

For n = 11321.3000 and

Log (n) = Log (11321.3000) = 9.3344

In continuation, we calculate the index for:

3rd Model: BIC = $G^2$ – (D.F.) Log (n) = 7.87497 – 216*9.3 = -2008.35543

5th Model: BIC = $G^2$ – (D.F) Log (n) = 7.50546 – 207*9.3 = -1924.71534

6th Model: BIC = $G^2$ – (D.F.) Log (n) = 7.04663 – 207*9.3 = -1925.17447

From these calculations, we could see that the best model is the 3rd, in other words the row effects model (R).

## ANALYSIS OF THE ASSOCIATION MODEL

Afterwards, we check the models to see whether any of them is acceptable. Checking is being done through the likelihood-ratio chi-square statistic $G^2$ and with the use of $X^2$ distribution. In the case of $X^2$ distribution Statgraph program will be of good help.

Firstly, the likelihood-ratio chi-square statistic for the Independence model (O) is $G^2$ = 19.00388 with 240 degrees of freedom (d.f.). (The 95th percentile of the reference chi-square distribution is 277.528). So, the model of independence (O) is accepted because it has a good fit since the $X^2$ distribution is much bigger than the likelihood-ratio chi-square statistic $G^2$.

In continuation the Uniform association model is $G^2$ = 18.94400 with 239 degrees of freedom (d.f.). The 95th percentile of the reference chi-square distribution is 276.449. As it could be noticed this statistics is accepted and has a satisfactory fit (adaptation) since the $X^2$ distribution is bigger than the likelihood-ratio chi-square statistic $G^2$.

The likelihood-ratio chi-square statistic $G^2$ for the R model is reduced dramatically and is = 7.87497 with 216 degrees of freedom (d.f.). The 95th percentile of the reference chi-square distribution is 251.584. In addition, we observe that the model has a very good fit because the $X^2$ distribution is much bigger than the likelihood-ratio chi-square statistic $G^2$.

The C model (years) has $G^2 = 18.56803$ with 230 degrees of freedom (d.f.). The 95th percentile of the reference chi-square distribution is 266.728. We therefore conclude also that this model show even a better fit since the $X^2$ distribution is very much bigger than the likelihood-ratio chi-square statistic $G^2$.

Moreover, the statistics of the model R+C, that takes into account the effects for both the gross operating surplus and the years in additive form is $G^2 = 7.50546$ with 207 degrees of freedom (d.f.). The 95th percentile of the chi-square distribution is 241.982. Similarly, this model has a better fit, because the $X^2$ distribution is very much bigger than the likelihood-ratio chi-square statistic $G^2$.

Finally the model of row-column effects in multiplicative form (RC), has $G^2 = 7.04663$ with 207 degrees of freedom (d.f.). The 95th percentile of the reference chi-square distribution is 241.982. Again the Statistics has a better fit just as the previous model because they have the same d.f, which shows to have an acceptable fit since the $X^2$ distribution is very much bigger than the likelihood-ratio chi-square statistic $G^2$.

We observe also that the row model (R) covers {(19.00388 – 7.87497)/19.00388} of = 59% of the total data. This means that roughly 60% of the total data were determined by each country's gross operating surplus and mixed income at current prices while 40% on unidentified factors.

However, we have to realise and in which degree of influence it has on each model. In order to verify this we will have to construct the table of Analysis of association (ANOAS).

## ANALYSIS OF ASSOCIATION TABLE (ANOAS)

The ANOAS Table 4, was given by Goodman (1979b). In this table, the chi-squared are the partitioned as sums of square in a two-factor analysis of variance using the likelihood. The ANOAS table partitions the effects on association show the percent of the likelihood-ratio chi-square statistic $G^2(O)$ for basic (null) model of independence that measures the total deviation of the variables. In other words, we can find the percentage of baseline chi-squared $X^2$ distribution, which influences each of our model's phenomenon under study.

TABLE 4. THE ANOAS TABLE

| Effects | Model used | $G^2$ | D.F | Percentage |
|---|---|---|---|---|
| 1. General | O-U | 0.05988 | 1 | 0.31% |
| 2. Rows | U-R | 11.06603 | 23 | 58.24% |
| 3. Columns | R-RC | 0.82834 | 9 | 4.35% |
| 4. Residual | RC | 7.04663 | 207 | 37.08% |
| Total | O | 19.00388 | 240 | ≈ 100.00% |

The analysis of association table has the following differences of our models: O-U is the total effects model, U-R are the column effects model, R-RC are the column effects model that gives the effect of columns and RC are the residuals of the models.

As shown from the ANOAS table we created, the uniform effects are weak because the U model accounts for 31% of the baseline chi-squared value. The row effects are strong because the R model accounts for 58.24% of the baseline chi-squared $X^2$ distribution value. Moreover, the column effects are very weak because the C model accounts for only 4.35% of the baseline chi-squared value. Finally, the residual model RC accounts for 37.08%.

TABLE 5. MODEL ESTIMATION

| ROW (COUNTRIES) | COLUMN (YEARS) | DATA OBSERVED $f_{ij}$ | Expected freq. model (0) $f_{ij}$ | Expected frequency of model (R) Fij |
|---|---|---|---|---|
| 1 | 1 | 37.8000 | 36.7349 | 37.2923 |
| 2 | 1 | 47.6000 | 47.9336 | 48.2315 |
| 3 | 1 | 34.5000 | 32.2120 | 33.6437 |
| 4 | 1 | 36.4000 | 36.9430 | 36.4253 |
| 5 | 1 | 33.0000 | 40.1723 | 36.0305 |
| 6 | 2 | 44.6000 | 47.5669 | 45.9284 |
| 7 | 2 | 56.8000 | 54.6657 | 55.6073 |
| 8 | 1 | 42.6000 | 41.3121 | 41.6090 |
| 9 | 1 | 34.5000 | 34.1297 | 34.3088 |
| 10 | 1 | 48.2000 | 46.9114 | 47.8172 |
| 11 | 1 | 46.0000 | 44.2948 | 48.2737 |
| 12 | 1 | 43.1000 | 45.8531 | 42.0874 |
| 13 | 1 | 50.0000 | 48.5668 | 47.9302 |
| 14 | 1 | 42.8000 | 40.7784 | 42.6030 |
| 15 | 1 | 37.3000 | 40.2899 | 39.8201 |
| 16 | 1 | 45.4000 | 43.0851 | 46.0882 |
| 17 | 1 | 38.8000 | 38.1732 | 39.0131 |
| 18 | 1 | 34.9000 | 37.0153 | 34.7544 |
| 19 | 1 | 47.0000 | 47.3366 | 44.7555 |
| 20 | 1 | 37.8000 | 37.3772 | 37.7503 |
| 21 | 1 | 29.4000 | 32.1758 | 30.8810 |
| 22 | 1 | 47.7000 | 48.8563 | 46.7308 |
| 23 | 1 | 39.5000 | 39.5391 | 39.5088 |
| 24 | 1 | 35.5000 | 30.1586 | 33.5447 |
| 25 | 1 | 33.4000 | 32.0582 | 33.6293 |

As seen from Table 5, the values of the row effects model (R) show how they fit better in the data.

## SUMMARY

All the six association models show accepted fit. The values of the row effects model (R) gives the best fit as shown in the data. The estimated effects (percentage of GDP) for the Gross operating surplus and mixed income at current prices in 25 EU countries for the period of 1998-2008 are:

Belgium: $\hat{\tau}_1$ = Log (0.99679) = -0.0032 Lithuania: $\hat{\tau}_{13}$ = Log (1.00243) = 0.0024

Chech Republic: $\hat{\tau}_2$ =Log(0.99856)=-0.0014 Luxemburg: $\hat{\tau}_{14}$ =Log(0.99103)= -0.0090

Denmark: $\hat{\tau}_3$ =Log(0.99109) = -0.0089 Hungary: $\hat{\tau}_{15}$ = Log ( ) = (1.00214) = 0.0021

Germany: $\hat{\tau}_4$ = Log (1.00261) = 0.0026 Malta: $\hat{\tau}_{16}$ = Log (0.98626) = -0.0138

Estonia: $\hat{\tau}_5$ = Log (1.02129)= 0.0210 Netherlands: $\hat{\tau}_{17}$ = log (0.99545) = -0.0045

Ireland: $\hat{\tau}_6$ = Log (1.00856) = 0.0085 Austria: $\hat{\tau}_{18}$ = Log (1.01230) = 0.0122

Greece: $\hat{\tau}_7$ = Log (0.99560) = -0.0044 Poland: $\hat{\tau}_{19}$ = Log (1.01093) = 0.0108

Spain: $\hat{\tau}_8$ = Log (0.99837) = -0.0016 Portugal: $\hat{\tau}_{20}$ = Log (0.99782) = -0.0021

France: $\hat{\tau}_9$ = Log (0.99876)= -0.0012 Slovenia: $\hat{\tau}_{21}$ = Log (1.00797) = 0.0079

Italy: $\hat{\tau}_{10}$ = Log (0.99598)= -0.0040 Slovakia: $\hat{\tau}_{22}$ = Log (1.00864) = 0.0086

Cyprus: $\hat{\tau}_{11}$ = Log (0.98216)= - 0.0180 Finland: $\hat{\tau}_{23}$ = Log (0.99996) = -0.0004

Latvia: $\hat{\tau}_{12}$ = Log (1.01676) = 0.0166 Sweden: $\hat{\tau}_{24}$ = Log (0.97833) = -0.0219

United Kingdom: $\hat{\tau}_{25}$ = Log (0.99021) = -0.0098

We now compare some of the 25 EU countries with each other in relation to the percentage of GDP for the gross operating surplus and mixed income at current prices. According to Haritou & Nwaubani (2009), the difference to the percentage of GDP for the gross operating surplus and mixed income at current prices between Germany and the United Kingdom, we have: $\hat{\tau}_4$ - $\hat{\tau}_{25}$ = 0.01 and exp (0.01) = 1.01, it means that Germany had 1% of GDP greater than the United Kingdom.

In the case of Mediterranean countries like Greece and Spain, we have: $\hat{\tau}_7$ - $\hat{\tau}_8$ = 0.00, and exp(0.00) = 1, we find out that Greece had 1% of GDP greater than Spain.

The difference to the percentage of GDP for the gross operating surplus and mixed income at current prices between Italy and Greece, is: $\hat{\tau}_{10} - \hat{\tau}_{7}$ = 0.00, exp(0.00) = 1, thus, Italy had 1 % of GDP higher than Greece.

Comparing Greece and Ireland, we have: $\hat{\tau}_{7} - \hat{\tau}_{6}$ = -0.01, and exp(-0.01) = 0.99, this means that Greece had 0.99% of GDP slightly lesser than that of Ireland in relation to the gross operating surplus and mixed income at current prices.

Even among the advanced countries of Europe, the difference is not much in number. Specifically between Germany and France, we have: $\hat{\tau}_{4} - \hat{\tau}_{9}$ = 0.00, and exp(0.00) = 1, we find out that Germany had 1% of GDP higher than France as regards to the gross operating surplus and mixed income at current prices.

In the case of Central European countries like, Czech Republic and Slovakia, we have: $\hat{\tau}_{2} - \hat{\tau}_{22}$ = -0.01, and exp(-0.01) = 0.99, it means that Czech Republic had 0.99% of GDP slightly lower than that of Slovakia in relation to the gross operating surplus and mixed income at current prices.

Finally, comparing the Scandinavian countries like Finland and Sweden, we see that: $\hat{\tau}_{23} - \hat{\tau}_{24}$ = 0.02, exp(0.02) = 1.02. In otherwords, Finland had almost 1% of GDP than Sweden as regards to the gross operating surplus and mixed income at current prices.

Finally, in order to realise the degree of association (correlation), which exists between the countries and years (row and column models), we use θ (Theta) of the second model, the (uniform association U) to calculate the indicator of innate association – i.e. **ϕ** (phi)**.**

## THETA (FOR THE MODEL II) = 0.99

We observe that the price of θ (Theta) is found within the frequency of 1%, which means that the variables are independable among themselves.

The odds ratio is θ (Theta) = 0.99. The parameter of interaction is ϕ (phi) = ϕLogθ

Log (0.99990) = -0.0001. The ϕ (phi) ½ **=** √0.0001= 0.01, thus the ϕ (phi) ½ of **-**√0.0001= -0.01

## CONCLUSION

Generally, we find out that the row effects model (R) gives the best fit among all. However, to be more precise, the percentage of GDP for the gross operating surplus and mixed income were influenced by several factors. This may be due to:

- Standard of living of each country;
- Differences in the distribution of income;
- Differences in hours worked;
- Hidden economies;
- Educational level of workers in each country;
- Difficulty of assessing true values;
- Level of the economy of each country (e.g. a country that depends on loan for survival); and
- Other factors that is difficult to be identified or determined.

Moreover, we could easily see from the comparisons that the 25 EU countries' percentage of GDP for the Gross operating surplus and mixed income at current prices were slightly the same. Based on the results of the research, we can see that the relationship between the 25 EU countries and the years are slightly negative as regards to the gross operating surplus and mixed income at current prices. In other words, there is no change in the association. The degree of association (correlation) is zero independence.

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