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Volume VI

OTHER TOPICS

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SEASONAL ADJUSTMENTS
OF INDONESIAN TIME SERIES

Report # 11

by
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Statistical Assistance to the Government of Indonesia (STAT) Project
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I. INTRODUCTION

The objective of seasonal adjustment is to remove the seasonal component of a time series without distorting the remainder of the series. The most important uses of seasonally adjusted data are in short term forecasting and policy analysis. The seasonal component is considered of less interest in policy analysis, as it is exogenous to the economic system. Thus most macroeconomic series may be appraised, if they are available, in their seasonally adjusted form.

The seasonal variation is seen as being the result of systematic, though not necessarily regular, intra-year movements in economic time series which are often caused by non-economic phenomena, such as climatic changes.

It should be noted that not all economic series contain statistically significant seasonal components. Thus when applying a "seasonal adjustment" procedure, the result may well be that no significant seasonality is found.

II. CONCEPTUAL BACKGROUND

A. Decomposition of Time Series

Seasonal adjustment of time series is performed under the assumption that the time series can be decomposed in the following way:

$$Y_t = C_t + S_t + I_t$$

where C_t refers to the trend-cycle, S_t to the seasonal and I_t to the irregular components of the time series. This decomposition is referred to as additive seasonal adjustment. The adjusted time series will be:

$$Y_{adj,t} = Y_t - S_t$$

The "trend-cycle" component shows the medium to long term movements of the series, including significant turning points. The "seasonal" component shows the within-year fluctuations about the trend that recur in a similar way in the same month (or quarter) from year to year. The "irregular" component is the residual that remains after the seasonal and trend-cycle components have been removed from the original series.

A better representation for series that are subject to growth is the multiplicative decomposition:

$$Y_t = C_t * S_t * I_t$$

where the seasonal component (S) and the irregular component (I) are assumed to be ratios centered about 1. In this case the seasonally adjusted time series will be obtained as:

$$Y_{adj,t} = Y_t / S_t$$

and equivalently

$$Y_{adj,t} = (C_t * S_t * I_t)/ S_t = C_t * I_t$$

To apply multiplicative adjustment all observations of the time series must be positive. The parameters for a seasonal adjustment model could be estimated using regression analysis. This would however result in the estimation of a model with fixed coefficients. Because the seasonal pattern can shift over time, for example, due to the declining importance of agriculture in the economy, it is preferable to use moving averages to represent the irregular component of the seasonal model.

B. Using Moving Averages

Because moving averages are used to decompose the series into trend, seasonal and irregular components, only the seasonal factors within the span excluding approximately the last (and first) three years of a series can be considered definitive. This is because only for these observations can symmetric moving averages be used, i.e. there are an equal number of lagging and leading observations available in the time series. For the final observations asymmetric moving averages must be used instead. The seasonally adjusted value for the current observation, i.e. the last observation of the time series, is therefore subject to the most uncertainty. But it is exactly the current value of a time series that it is most important for policy analysis.

The moving averages most often used for smoothing the seasonal factors, irregulars etc. for the same month (quarter) are the five term 3x3 and the seven term 3x5 symmetric moving averages. Their weights are shown in Table 1.

Table 1
Weights for Selected Moving Averages

Mvg Avg	year t-3	year t-2	year t-1	year t	year t+1	year t+2	year t+3
3x3	-	1/9	2/9	3/9	2/9	1/9	-
3x5	1/15	2/15	3/15	3/15	3/15	2/15	1/15

Thus the 3x5 moving average cannot be used for the first three and last three years. For these years asymmetric moving averages are used instead.

C. Measuring Quality

Although one can run a seasonal adjustment algorithm mechanically through any time series, this does not necessarily imply that the seasonal adjustment measures are reliable. To measure the quality of such measures, several specific statistics can be used. The X-11 and X12 programs, which are the most widely used worldwide, use 11 specific measures of quality and two measures of overall quality of seasonal adjustment:

M1: This measures the contribution of the irregular component to total variance. If this contribution is too large, it will be difficult to extract a seasonal component.

M2: This measures the contribution of the irregular component to the stationary portion of total variance. If this contribution is too large, it will be difficult to extract a seasonal component.

M3: This measures the amount of change in the irregular component relative to the amount of change in the trend cycle, using the I/C ratio. For multiplicative adjustment this is the ratio of the average rate of growth of the irregular divided by the average rate of growth of the trend cycle.

M4: The irregular component has to be random to validate the F tests carried out during X-11 processing. This is measured here on the basis of the average duration of run (ADR) of the irregular.

M5: This measures the number of months (quarters) needed for the absolute variations of the trend-cycle component to exceed those of the irregular component. It is also referred to as the MCD (Months of Cyclical Dominance) statistic. It indicates the relative importance of the irregular component versus that of the trend-cycle component.

M6: This measures the amount of year-to-year change in the irregular as compared to the amount of year-to-year change in the seasonal component. This measure is referred to as the I/S ratio.

M7: This measures the amount of stable seasonality F_s relative to the amount of moving seasonality F_m. It is used to determine whether seasonality can or cannot be identified by X11.
Table F2-I presents the results of a test for the presence of identifiable seasonality "ids" combining the F tests for the presence of stable seasonality F_s and moving seasonality F_m, with a non-parametric test for the presence of stable seasonality (the Kruskal-Wallis test). This statistic is summarized on the output log with the message "Identifiable seasonality: yes" for values of M7 below 1.00 and the message "Identifiable seasonality: no" for values of M7 above 1.00.

M8: The size of the fluctuations in the seasonal component over the length of the series, as measured by the average of the absolute annual changes in the seasonal factors.

M9: The size of the systematic (linear) movement in the seasonal component over the length of the series, as measured by the average of annual changes in the seasonal factors.

M10: The size of the fluctuations in the seasonal component over the last three years of the series, as measured by the average of the absolute annual changes in the seasonal factors.

M11: The size of the systematic (linear) movement in the seasonal component over the last three years of the series, as measured by the average of annual changes in the seasonal factors.

Q: This is an overall quality statistic calculated using a linear combination of statistics M1 to M11. The weights are (10, 11, 10, 8, 11, 10, 18, 7, 7, 4, 4). Statistics M8 to M11 can only be calculated if the series covers at least six years. For shorter series the weights used to calculate Q are (14, 15, 10, 8, 11, 10, 32, 0, 0, 0, 0). Note that statistic M7 has the largest weight in the calculation of statistic Q.

Q2: This is an overall quality statistic calculated by X12-ARIMA which is the Q statistic excluding statistic M2.

Table F3 of the X-12-ARIMA output (see example in Appendix A) presents all 13 quality control statistics for the series that is being seasonally adjusted. These statistics are normalized to fall within the region 0 to 3, with values greater than 1 considered to be unacceptable. As an overall measure of the acceptability of the results X-12 presents the quality summary statistic “Q”, which is a weighted average of the 11 quality control indicators (M1 to M11).

Note that the X-12 program calculates seasonally adjusted series, even if the quality indicator “Q” shows that the result of the seasonal adjustment process is unacceptable. Therefore, for all series that are seasonally adjusted reference to the quality statistics of Table F3 is necessary, before an opinion about the adequacy of the seasonal adjustment process can be given.

III. COMPUTER PROGRAMS

A. Background

Starting in the 1930’s moving average techniques were used to remove seasonality from economic time series. With experience from adjusting many time series, the methods used were refined, culminating in 1967 in the X-11 method of the U.S. Bureau of the Census. The seasonal adjustment process is applied two times. In the first round of estimation, the irregulars are adjusted for “extreme values”. These adjusted values are based on the values of the irregulars, which were not adjusted, for the same month.

B. X11-ARIMA

1. Description

To improve the estimation of the current seasonal factors the X11-ARIMA program was developed at Statistics Canada starting in 1970. ARIMA is an abbreviation of "Auto-Regressive Integrated Moving Average" model. This program extends the time series with forecasts (and backcasts) using a seasonal Box-Jenkins model. This makes it possible to apply the seasonal adjustment moving average filters to the extended time series. In this way problems that occur as a result of applying seasonal weights to the components of the series near the end (and beginning) of the series are mitigated. The Box-Jenkins ARIMA model used is of the following form:

$$Y_t = (p\ d\ q)\ (P\ D\ Q)\ s,$$

where "p" refers to the non-seasonal and "P" to the seasonal auto-regressive parameters, "d" refers to non-seasonal and "D" to seasonal differencing, "q" refers to the non-seasonal and "Q" to the seasonal moving average parameters, and s is 12 for monthly and 4 for quarterly time series. It was found that the use of the Box-Jenkins method improves the estimated seasonal factors, in the sense that the first estimates are closer to the final seasonal factors. The improvement is of an order of magnitude of up to 50%.

To properly estimate a Box-Jenkins model the sample auto-correlation function (ACF) and the sample partial auto-correlation function (PACF) of the residuals for the model should be analyzed, to determine which AR and MA coefficients are to be included in the model. Experience with a large number of series at Statistics Canada resulted in the selection of five Box-Jenkins models that perform well with about 80%-90% of the time series submitted for seasonal adjustment. These models are:

(0 1 1)(0 1 1)s, (0 1 2)(0 1 1)s, (2 1 0)(0 1 1)s, (0 2 2)(0 1 1)s and (2 1 2)(0 1 1)s

with the first model being the default model. These models are included as pre-selected models in X11-ARIMA.

The (0 1 1)(0 1 1)s model may be interpreted in the following way. The model has d=1 and D=1, this means that for a monthly time series a transformed series W_t is obtained as follows:

$$W_t = (X_t - X_{t-12}) - (X_{t-1} - X_{t-13})$$

where the W_t series is a stationary series. With q=1 and Q=1, the following equation is estimated:

$$W_t = \quad + Z_t + \ {}_1Z_{t-1} + \ {}_2Z_{t-12}$$

where the Z series denotes a random process, and is a constant. It should be noted that the ARIMA model is used only to extend the series, after which the regular X11 seasonal adjustment is performed.

2. Adjustment for Calendar Effects

The X-11 program includes the option of user-selected adjustments for trading days, i.e. the number of working days in a particular month. It also can adjust for the effect of the occurrence of certain holidays, for example Easter. In Indonesia the effect of the occurrence of the Idul Fitri holiday on the seasonal adjustment may be important for some series. The effect should be especially noticeable in monthly flow series, such as the demand for transportation.

Calendar effects consist of trading day and holiday adjustments. These are also referred to as "prior adjustments". The prior adjustment factors are applied to the original series before the seasonal adjustment process is started. If these factors are present the model estimated is thus of the following form:

$$Y_t = C_t * S_t * P_t * I_t$$

where P_t refers to the prior adjustment factors. The seasonal adjustment procedure is then applied to the prior adjusted series:

$$Y_{prior,t} = Y_t / P_t$$

The seasonally adjusted series is thus obtained as

$$Y_{adj,t} = Y_{prior,t} / S_t = Y_t / (S_t * P_t)$$

3. Constraints on the Seasonally Adjusted Series

An option is available to force the yearly totals for the seasonally adjusted and unadjusted data to be the same, through the use of command "force" in the X11 spec. The "component" spec is used to obtain both indirect and direct adjustments of the total of a composite series. For example, housing starts by region may be aggregated to a national total.

C. X12-ARIMA

1. Description

Starting in 1998 the U.S. Census Bureau released a beta version of the X-12 ARIMA seasonal adjustment program, also referred to as X12-regARIMA. This program includes several new options, mostly relating to the prior adjustment of the time series. The term regARIMA refers to "regression" ARIMA, to highlight the fact that the options for regression estimation of the prior adjustment factors have improved over those available in X-11-ARIMA.

X11-ARIMA and X12-ARIMA are both written in Fortran and are MS-DOS based. However, the commands for X12-ARIMA are more intuitive than those used by X11-ARIMA. Also the X12-ARIMA User's Manual is quite detailed, and includes a large number of examples to demonstrate the options for the various commands.

2. Preparing Instruction Sets

The X12-ARIMA program functions through the use of specifications (specs). Each of these specs can be modified with arguments, which in most cases have a default value. In this report only a sub-set of the specifications and arguments are covered. The X12-ARIMA reference manual[1] should be consulted for further details. This manual is distributed with the X12 program in machine readable form

The X12-ARIMA specifications covered in this report are listed in Table 2.

Table 2
X12-ARIMA specifications

Specs	Status	Description
automdl	Optional	Specifies which models will be used in the regARIMA model
outlier	Optional	Allows for automatic detection of various types of outliers
series	Required	Enters information on the time series to be seasonally adjusted
transform	Optional	Transforms the series prior to estimating a regARIMA mode
x11	Required	Performs X11 seasonally adjustment
x11regression	Optional	Estimates prior adjustment regression model of regARIMA

Each set of individual specifications (specs) starts with the symbol "{" and ends with the symbol"}". Arguments relating to the spec are entered between these two symbols. Note that "arguments" are in this report referred to as commands.

3. MS-DOS Commands

The seasonal adjustment program is called "x12a.exe". It is located in directory "c:\x12a\". Its full MS-DOS path name must be given when executing command "x12a". As an alternative, the path name for "x12a.exe" may be included in the "autoexec.bat" file. The instruction set for a seasonal adjustment run is entered in free format in a text file with extension "spc". The MS-DOS instruction to run X12ARIMA on an instruction set "test.spc", when files

[1]U.S. Census Bureau, X-12-ARIMA Reference Manual, Version 2.7, May 2000

x12a.exe and test.spc are both located in the current directory, is:

```
x12a   test
```

Note that the extension is not entered in the MS DOS command.

4. Using More than One Instruction Set

In a production situation it is important to be able to run several series in one X12-ARIMA run. This is accomplished by executing a metafile, in which the file names of the instruction sets are listed. Its extension is "mta". For example, the following file will execute the three above examples in one run. Contents of meta file gdp_prg.mta are:

```
gdp_a
gdp_b
gdp_c
```

This meta file is run by executing the following command in MS-DOS:

```
X12a  -m  gdp_prg
```

5. Using More Than One Data Set

Another common situation is that the same instruction set is run on more than one data series. In this case a data metafile is created. Its extension is "dta". Because the data are entered from a data meta file, it is illegal to include a "file" command in the instruction set. Instruction set gdp_d is equal to gdp_c, except that the file command in the series spec has been removed. For example the following data metafile was used to run instruction set gdp_d on the eleven GDP series at the 1 digit level. Contents of data meta file gdp_dat.dta are:

```
gdp1.txt
gdp2.txt
gdp3.txt
.....
gdp9.txt
gdptot.txt
gdptmg.txt
```

This meta file is run by executing the following command in MS-DOS:

```
x12a gdp_d  -d  gdp_dat
```

IV. APPLICATIONS

Series from the Agriculture, Industry, Prices, Production Accounts and the Trade and Services Bureaus of BPS were seasonally adjusted and results were shared with the relevant bureaus.

A. GDP

The following three instruction sets were used to seasonally adjust the series of total GDP in 1993 rupiah. The first run presents the minimum instruction set needed to seasonally adjust a time series. It only uses the "series" spec and the 'x11" spec. The instruction set for the second run uses in addition the "x11regression" spec, to estimate calendar effects for prior adjustment of the time series. The instruction set for the third run uses in addition the "automdl" spec and the "transform" spec, to provide options for estimating the ARIMA model used to extend the series prior to applying the X11 seasonal adjustment module. The results from these three runs show improvement in the quality of seasonal adjustment comparing the first run, the second run and the third run.

1. First Run

Contents of instruction set "gdp_a.spc":

```
#       Spec for data entry:
series          {start=1993.1
                 span=(1993.1, 1999.4)
                 period=4
                 file="gdptot.txt"
                 title="Total GDP constant rupiah"
                 decimals=2                    }

#       Spec for seasonal adjustment:
x11             {        }
```

The "decimal" command of the "series" spec indicates the number of decimals to be used in the output tables. The "span" command restricts the analysis to the period 1993 Q1 to 1999 Q4, which is the full period analyzed. Because no path name is given in the "file" statement, the data file "gdptot.txt" must be available in the current directory. Comments follow the symbol"#". They may be entered as separate lines or to the right of a command.

A "format" command is used to enter the Fortran fixed format used to create the data file. If a "format" command is not included, as is the case in this example, the data is read in free format. In free format all numbers on a line will be read before continuing to the next line. The numbers must be separated by one or more spaces (not by commas or tabs). Because no commands are entered for the X11 spec, program-set default values will be used for the X11 seasonal adjustment module. For example, the default for the type of seasonal adjustment to be performed is multiplicative adjustment.

2. Second Run

This run is equivalent to run 1, except that the "x11regression" spec is used to estimate calendar effects. In this spec the "variables" command indicates that trading day effects are to be estimated (option "td"). Contents of instruction set "gdp_b.spc" are:

```
#         Spec for data entry:
series              {start=1993.1
                    span=(1993.1, 1999.4)
                    period=4
                    file="gdptot.txt"
                    title="Total GDP constant rupiah"
                    decimals=2                              }

#         Spec for seasonal adjustment:
x11                 seasonalma=msr            # default
                    print=(none + d10 + d11 + d16 + f3)     }

#         Optional spec to estimate calendar effects:
x11regression       {variables= td
                    aictest=td
                    sigma=2.50                # default
                    print=(none + c16 + aictest}            }
```

Command "aictest" specifies that an AICC test (an AIC test corrected for the length of the series) will be performed on the regression model with trading day ("td") and the regression model without trading day effects. The regression model with the smaller AICC is selected to generate forecasts, identify outliers, etc. In other words, if the trading day adjustment does not result in a statistically significant improvement, it will not be included in the prior adjustment regression variables. The "sigma" command sets the sigma limit for excluding extreme values of the irregular components before trading day regression is performed. The default value is 2.50. Note that it was not possible to include a test for the effect of the Idul Fitri holiday, because this holiday fell during the period analyzed in the first quarter, and can therefore not be estimated separately from the seasonal factors.

The "seasonalma" command of the "x11" spec specifies which seasonal filters will be used to estimate the seasonal factors. The default value is "msr", which refers to the "moving seasonality ratio" procedure, in which the program chooses the final seasonal filter automatically.

In this run the two "print" commands are used to restrict the output of the program to a sub-set of the regular output.

3. Third Run

This run is equivalent to run 2, except that the "automdl" and "transform" specs are used to select the ARIMA model that will be used as part of regARIMA. The example uses file "x12a.mdl". This file holds the specifications for the five pre-selected ARIMA models listed above. The "mode" command for the "automdl" spec, indicates that one year of forecasts are to be obtained, option “fcst”. A year of forecasts and a year of backcasts are produced if option “both” is selected. The “method” command for the “automdl" spec, indicates if the first acceptable model is to be used, option “first” (the default), or if all models specified in the model file are to be evaluated, with the ARIMA model with the best performance selected, option “best”.

When using the “automdl” spec, the automatic modeling procedure selects ARIMA models based on the value of the absolute average percentage error of the estimates for the last three years of data. The minimum acceptable value is set with command “fcstlim”. The automatic modeling procedure will also reject an ARIMA model if the model fails the overdifferencing test. For this test the sum of the non-seasonal MA parameters must not be greater than the value set with command “overdiff”.

The “function” command of the “transform” spec indicates the type of transformation to be performed. The default is no transformation. In the example, option “log” is required, because the multiplicative decomposition is specified in the x11 spec.

If all values of the series are positive, option “auto” of the “function” command performs an AICC test to choose between log transformation and no transformation by fitting a regARIMA model to both series.

The “savelog” command of the “X11" spec outputs summary results from the seasonal adjustment run to the session log file. The file name is obtained by replacing the extension of the instruction set being executed “spc”, with “log”.

The “save” command of the “X11" spec outputs the tables indicated in machine readable format to the current directory. The file name is obtained by replacing the extension of the instruction set being executed “spc”, with the table number. Thus in run 3, two files will be created, gdp_c.d11 and gdp_c.d16.

Contents of instruction set “gdp_c.spc” are:

```
#           Spec for data entry:
series            {start=1993.1
                  span=(1993.1, 1999.4)
                  period=4
                  file="gdptot.txt"
                  title="Total GDP constant rupiah"
                  decimals=2
                  print=(none + header + specfile + a1)        }

#           Spec for seasonal adjustment:
x11               {mode=mult                        # default value
                  seasonalma=msr                    # default value
                  print=(none + d10 + d11 + d12 + d16 + f3)
                  savelog =(ids m1 m2 m3 m4 m5 m6 m7 q q2)
                  save=(d11 d16)                              }

#           Optional spec to estimate calendar effects:
x11regression {variables=td
                  aictest=td
                  sigma=2.50                        # default value
                  print=(none + c16 + aictest)                }

#           Optional spec for automatic estimation of an ARIMA model
automdl           {mode=fcst                        #  default value
                  file="c:\x12a\x12a.mdl"
                  method=best                        #  default is "first"
                  fcstlim=20                         #  default is 15
                  overdiff=0.95                      #  default  is 0.90
                  print=(none)
                  savelog=automodel                           }

#           Spec to transform the data for the ARIMA model
transform         {function=log                       # default is "none"
                  print=(none)                                    }
```

The results from run 3 are attached as Appendix A.

4. Quality of Adjustments

The "savelog" command outputs quality control measures ids, M1 to M7, Q and Q2 to the session log, so that these measures can be readily evaluated. Appendix B presents the summary measures for the three successive seasonal adjustment runs of Total GDP discussed above. The results for ids (identifiable seasonality), M7 and Q are presented in the following table.

Table 3
Selected Quality Measures for Total GDP

Industrial origin	series	ids	M7	Q	Q2
Gross Domestic Product - Run #1	gdptot	yes	.611	.524	.579
Gross Domestic Product - Run #2	gdptot	yes	.453	.395	.439
Gross Domestic Product - Run #3	gdptot	yes	.468	.367	.409

The results show that the quality measures for all three runs were satisfactory. However, there is an improvement in the overall quality of seasonal adjustment, as measured by Q and Q2, going from run 1 to run 3.

As for 1-digit level GDP, the “savelog” command outputs quality control measures ids, M1 to M7, Q and Q2 to the session log, so that these measures can be readily evaluated. Appendix C presents the summary measures for the eleven component series of GDP at the 1 digit level. The results for ids (identifiable seasonality), M7 and Q are presented in the following table.

Table 4
Selected Quality Measures for GDP at the 1 digit level

Industrial origin	series	ids	M7	Q	Q2
Agriculture	gdp1	yes	.262	.422	.450
Mining & quarrying	gdp2	yes	.150	.135	.135
Manufacturing	gdp3	yes	.223	.228	.252
Electricity, Gas & Water	gdp4	yes	.117	.194	.216
Construction	gdp5	yes	.548	.289	.323
Trade, Hotel & Restaurant	gdp6	yes	.511	.469	.532
Transport & Communication	gdp7	yes	.614	.408	.463
Financial, Rental & Business Services	gdp8	no	1.089	.880	.996
Services	gdd9	yes	.454	.395	.448
Gross Domestic Product	gdptot	yes	.468	.367	.409
Gross Domestic Product excl. Oil & Gas	gdptmg	yes	.480	.380	.423

The results show that the quality measures for the seasonal adjustment of these series were satisfactory, except for Financial, Rental & Business Services.

It is to be noted that a lower value of Q does not imply that the level of seasonality in a series is more pronounced, but rather that the effects of the irregular and of moving seasonality are relatively less important than the effect of stable seasonality. The following table presents the averages of the seasonal factors for the eleven series of GDP at the 1 digit level. This data is obtained from Table D10 for each of the seasonal adjustment runs.

Table 5
Average seasonal factors for GDP at the 1 digit level

Industrial origin	series	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Agriculture	gdp1	105.0	107.0	101.7	86.4
Mining & quarrying	gdp2	98.6	97.8	101.1	103.3
Manufacturing	gdp3	95.9	94.5	103.3	106.9
Electricity, Gas & Water	gdp4	96.6	100.5	102.0	101.8
Construction	gdp5	98.4	94.5	102.7	104.4
Trade, Hotel & Restaurant	gdp6	99.1	97.5	101.0	102.2
Transport & Communication	gdp7	101.4	97.4	99.0	102.1
Financial, Rental & Business Services	gdp8	99.3	97.4	100.3	103.2
Services	gdd9	99.5	99.0	100.4	101.1
Gross Domestic Product	gdptot	99.0	98.1	101.8	101.1
Gross Domestic Product excl. Oil & Gas	gdptmg	98.8	98.2	101.9	101.1

The seasonal pattern which emerges from this table is that agricultural GDP has seasonal peaks in the first and second quarter and seasonal dips in the third and fourth quarter. The seasonal pattern for manufacturing GDP is reversed with seasonal dips in the first and second quarter and seasonal peaks in the third and fourth quarter. The other components of GDP show seasonal patterns which are less pronounced.

5. Calculating the Seasonally Adjusted Series

Based on the printout for the seasonal adjustment of series gdptot (file gdptot.out), as presented in Appendix A, the calculation of the seasonally adjusted data for 1999Q4 is shown below. Table A1 shows the unadjusted value for 1999Q4 to be 95,104.3. The final trading day factor (Table C16) is 100.252. The final seasonal factor (Table D10) is 101.145 and the combined seasonal and trading day factors (table D16) is 101.399. The seasonally adjusted value (Table D11) is 93,791.905. This value is obtained as follows:

D16 = C16*D10 i.e. 1.00252*1.01145=1.01399 or 101.399 as a percentage
D11 = A1 / D16 i.e. 95,104.3/1.01399=93,791.905

Alternatively, the seasonally adjusted value may be obtained by multiplying the Final Trend-Cycle data (Table D12) with the Final Irregular Factors (Table D13). For Q4 1999 we have

D11 = D12*D13 i.e. 93,954.035*0.99827=93791.494

6. Projection of Seasonal Factors

The seasonal factors are projected for one calendar year. The factors are printed as percentages in respectively Tables C16A, D10A and D16A. The purpose of this projection is to enable the user to limit the number of times seasonal adjustment has to be performed to once a year. This is to avoid spurious movements in the seasonally adjusted data, even if the unadjusted data have not changed. The value for unadjusted total GDP for Q1 2000 is 96,985.6 and the combined seasonal and trading day factor from table D16A is 99.604. The seasonally adjusted value for total GDP for Q1 2000 is thus:

D11 = A1 / D16A i.e. 96,985.6/0.99604 = 97,371.2

B. Consumer Price Index

The instruction set used to seasonally adjust the series of all items CPI for the period January 1990 to July 2000 is presented below. The "outlier" spec allows for automatic detection of additive outliers ("ao"), temporary change outliers ("tc") and level shifts ("ls") or any combination of these three types of outliers. Command "type" indicates the type of outliers to be evaluated. The default is to use types "ao" and "ls". Command "critical" sets critical values for the outlier detection spec. The default values are determined by the length of the data series. For a length of up to 48 observations the critical value is 3.6548.

Contents of instruction set "cpi_x01" are:

```
#          Spec for data entry:
series              {start=1990.1
                    span=(1990.1, )
                    period=12
                    file="cpi_tot.txt"
                    title="Consumer Price Index - All Items"
                    decimals=2
                    print=(none + header + specfile + a1)          }

#          Spec for seasonal adjustment:
x11                 {mode=mult                          # default value
                    seasonalma=msr                      # default value
                    print=(none + d10 + d11 + d12 + d16 + f3)
                    savelog =(ids m1 m2 m3 m4 m5 m6 m7 q q2)
                    save=(d11 d16)                              }

#          Optional spec to estimate calendar effects:
x11regression {variables=td
                    aictest=td
                    sigma=2.50                          # default value
                    print=(none + c16 + aictest)                 }

#          Optional spec for automatic estimation of an ARIMA model
automdl             {mode=fcst                          #  default value
                    file="c:\x12a\x12a.mdl"
                    method=best                          #  default is "first"
                    fcstlim=20                           #  default is 15
                    overdiff=0.95                        #  default  is 0.90
                    print=(none)
                    savelog=automodel                            }

#          Spec to transform the data for the ARIMA model
transform           {function=log                         # default is "none"
                    print=(none)                                          }

#          Optional spec to detect outliers in "x11regression"
outlier             {types=(ao ls)                        # default value
                    critical=(3.75)
                    span=(1997.1, 1999.12)
                    method=addone                         # default value
                    print=(none + header)                                 }
```

Raising the critical value decreases the sensitivity of the outlier detection procedure, possibly decreasing he number of observations treated as outliers in the regARIMA model. It is possible to set different critical values for the three outlier types. This is important when the number of outliers identified may be large and for this reason estimation may not be possible due to singularity of the regressors used in the regARIMA prior regression step.

Another way to reduce the number of outliers which may have to be estimated, is to restrict the period for which outliers are estimated to a sub-period of the time series. This is done with the "span" command of the "outlier" spec. In the example outlier estimation is restricted to the period January 1997 to December 1999.

Command "method" indicates the way outliers are added to the regression data set. Option "addone" results in the outliers being added and evaluated for their statistical significance one at a time. The other option is "addall". The default value is "addone". Note that the LS (level shift) outliers are included in the final trend cycle estimates and not in the final irregular component. The results from running this example are attached as Appendix D.

C. Other Series

Other data series were also adjusted but results are not included in this report because data are not published. Results were provided to the relevant bureaus in BPS. A list of these series, indicating if the series were successfully adjusted, is presented in Table 6.

Table 6
Series Which were Seasonally Adjusted

	Data Series	Does Stable Seasonality Exist?	Measure of Overall Quality "Q"	Is the Seasonal Adjustment Acceptable?
	Quarterly GDP 1993 Prices:			
1	Agriculture, Livestock, Forestry & Fishery	Yes	0.42	Yes
2	Mining & Quarrying	Yes	0.14	Yes
3	Manufacturing Industry	Yes	0.23	Yes
4	Electricity, Gas & Water Supply	Yes	0.19	Yes
5	Construction	Yes	0.29	Yes
6	Trade, Hotel & Restaurant	Yes	0.47	Yes
7	Transport & Communication	Yes	0.41	Yes
8	Financial, Rental & Business Services	No	0.88	Conditional yes
9	Services	Yes	0.40	Yes
	Total GDP	Yes	0.37	Yes
	Total GDP excluding Oil-Gas	Yes	0.38	Yes
	Monthly Consumer Price Index:			
	All items CPI	Yes	0.50	Yes
	Beras	Yes	0.49	Yes
	Emas	No	1.21	No
	Minyak Goreng	No	1.38	No
	Quarterly Industrial Production:			
	2 digit level:			
31	Food, Beverages and Tobacco	Yes	0.13	Yes
32	Textiles, Textile Products and Leather	Yes	0.67	Yes
33	Wood and Wood Products	Yes	0.51	Yes
34	Paper, Printing and Publishing	No	1.02	Conditional no
35	Chemicals and Chemical Products	Yes	0.45	Yes
36	Non Metallic Mineral Products	Yes	0.22	Yes
37	Basic Metals	Yes	0.44	Yes
38	Fabricated Metal Products	Yes	0.19	Yes
39	Other Manufacturing Industries	Yes	0.38	Yes
30	Total Manufacturing	Yes	0.10	Yes
	5 digit level:			
31121	Manufacture of powdered, condensed and preserved milk	No	1.29	No
31144	Manufacture of frozen fish and other similar products	Yes	0.44	Yes
31151	Manufacture of crude vegetable and animal cooking oil	Yes	0.30	Yes
31154	Manufacture of cooking oil made of palm oil	Yes	0.18	Yes
31161	Manufacture of rice milling and husking	Yes	0.52	Yes
31163	Manufacture of peeling and cleaning of coffee	Yes	0.28	Yes
31171	Manufacture of macaroni, spaghetti, noodle and the like	Yes	0.73	Yes
31181	Manufacture of granulated sugar	Yes	0.55	Yes
31420	Manufacture of clove cigarettes	Yes	0.74	Yes
38392	Manufacture of dry cell batteries	Yes	0.63	Yes
	Agriculture Bureau:			
	Quarterly Production:			
	Jeruk	Yes	0.87	Conditional yes
	Pisang	No	1.03	Conditional no
	Forestry:			
	Meranti	Yes	0.34	Yes
	Bureau for Trade and Services Statistics:			
	Monthly Exports:			
36	Udang dan Kerang-kerangan	Yes	0.91	Conditional yes
71	Kopi	Yes	0.58	Yes
634	Kayu Lapis	Yes	0.70	Yes
32	Batubara	No	1.47	No
	Monthly Imports:			
	Wheat and Meslin unmilled - Volume (thousands of	No	2.55	No
	Wheat and Meslin unmilled - Value (millions of US$)	No	2.41	No
	Cotton - Volume (thousands of tons)	No	1.60	No
	Cotton - Value (millions of US$)	No	1.45	No
	Monthly Tourism:			
	Visitor arrivals in Indonesia	Yes	0.48	Yes

APPENDIX A
PRINTOUT FOR SEASONAL ADJUSTMENT OF TOTAL GDP

```
 Reading input spec file from cpi_x01.spc
 Reading data from cpi_tot.txt

1

              U. S. Department of Commerce, U. S. Census Bureau

                X-12-ARIMA monthly seasonal adjustment Method,
                           Release Version 0.2.7


          This method modifies the X-11 variant of Census Method II
          by J. Shiskin A.H. Young and J.C. Musgrave of February, 1967.
         and the X-11-ARIMA program based on the methodological research
          developed by Estela Bee Dagum, Chief of the Seasonal Adjustment
           and Time Series Staff of Statistics Canada, September, 1979.

     Primary Programmers: Brian Monsell, Mark Otto


    Series Title- Consumer price indexes (monthly)
    Series Name- cpi_x01
    08/30/00    12:40:14.52

      -Period covered-  1st month,1990 to  7th month,2000
      -Type of run - multiplicative seasonal adjustment

      -Sigma limits for graduating extreme values are 1.5 and 2.5 .
      -3x3 moving average used in section 1 of each iteration,
       3x5 moving average in section 2 of iterations B and C,
       moving average for final seasonal factors chosen by Global MSR.
      -Trading day irregular regression computed 1990.Janstarting
       excluding irregular values outside  2.50-sigma limits.
      -Trading day irregular regression estimates applied.
      -Trading day irregular regression applied as prior factors.
      -Irregular regression AIC test performed for trading day regressors.
      -Spectral plots generated for selected series
      -Spectral plots generated for series starting in 1992.Aug

  Tables labeled "First pass" are from an initial seasonal adjustment used to estimate
  irregular regression and/or X-11 Easter effects.
```

```
Number of parameters estimated (np)                                 6
Log likelihood                                                42.7197
Transformation Adjustment                                   -264.2931
Adjusted Log likelihood (L)                                 -221.5734
AIC                                                          455.1467*
AICC (F-corrected-AIC)                                       460.3967*
Hannan Quinn                                                 456.8602*
BIC                                                          461.9597*
-------------------------------------------------------------------
* NOTE: These statistics do not contain a penalty for parameters
        estimated by x11regression to produce the prior adjustment
        factors because the x11regression estimates are not maximum
        likelihood estimates.  Therefore they cannot be  compared to
        the statistics from models in which regression variables in
        a regARIMA model are used to estimate the same effects.
-------------------------------------------------------------------
```

```
FORECASTING
 Origin     1999.4
 Number          4

 Forecasts and Standard Errors of the Prior Adjusted and Transformed Data
  -----------------------------------------------------------
                                 Forecast   Standard
    Date        Data  Forecast    Error        Error  t-value
  -----------------------------------------------------------
  2000.1      11.482    11.440    0.043       0.0348     1.22
  2000.2                11.419                0.0585
  2000.3                11.461                0.0784
  2000.4                11.457                0.0935
  -----------------------------------------------------------

 Confidence intervals with coverage probability (0.95000)
 On the Original Scale Before Prior Adjustments
  --------------------------------------------
    Date          Lower     Forecast       Upper
  --------------------------------------------
  2000.1      86812.358    92943.280    99507.185
  2000.2      81159.898    91017.075   102071.443
  2000.3      81399.575    94928.722   110706.503
  2000.4      78748.870    94592.024   113622.595
  --------------------------------------------
```

```
      GDP constant rupiah at 1 digit level            PAGE   5, SERIES gdp_c

D 11  Final seasonally adjusted data
 From       1993.1 to 1999.4
 Observations         28
```

	1st	2nd	3rd	4th	TOTAL
1993	78607.721	80192.440	84228.621	85782.289	328811.071
1994	86918.124	88767.187	88924.258	89942.188	354551.758
1995	92985.456	95267.795	97149.532	97819.107	383221.890
1996	99020.450	101666.337	104388.024	106916.025	411990.837
1997	106957.949	108513.143	107907.230	108664.518	432042.840
1998	103776.012	91583.365	91686.605	90468.510	377514.492
1999	93397.600	95038.542	94928.429	93791.905	377156.476
AVGE	94523.330	94432.687	95601.814	96197.792	

```
 Table Total-        2665289.36   Mean-         95188.91   Std. Dev.-        8377.69
                                  Min -         78607.72        Max -      108664.52
```

GDP constant rupiah at 1 digit level PAGE 6, SERIES gdp_c

D 12 Final trend cycle
From 1993.1 to 1999.4
Observations 28
Trend filter 5-term Henderson moving average
I/C ratio 0.29

	1st	2nd	3rd	4th	TOTAL
1993	78164.333	80813.000	83694.564	85840.252	328512.150
1994	87180.428	88403.133	89026.202	90232.278	354842.041
1995	92754.412	95353.843	96961.891	97880.136	382950.282
1996	99187.975	101585.623	104536.559	106454.044	411764.201
1997	107521.404	108024.851	108655.437	107172.578	431374.271
1998	102012.360	95412.250	91415.064	91020.656	379860.330
1999	93032.492	94951.344	94858.014	93954.035	376795.885
AVGE	94264.772	94934.863	95592.533	96079.140	

Table Total- 2666099.16 Mean- 95217.83 Std. Dev.- 8243.25
Min - 78164.33 Max - 108655.44

GDP constant rupiah at 1 digit level PAGE 7, SERIES gdp_c

D 16 Combined adjustment factors
From 1993.1 to 1999.4
Observations 28

	1st	2nd	3rd	4th	AVGE
1993	99.901	98.988	101.217	100.967	100.268
1994	98.489	99.010	102.495	100.069	100.016
1995	99.546	99.027	101.178	100.793	100.136
1996	98.843	98.985	102.083	101.693	100.401
1997	98.554	98.904	101.998	102.423	100.470
1998	98.109	98.812	102.546	100.104	99.893
1999	100.616	98.747	100.209	101.399	100.243
AVGE	99.151	98.924	101.675	101.064	

Table Total- 2805.70 Mean- 100.20 Std. Dev.- 1.39
Min - 98.11 Max - 102.55

D 16.A Combined adjustment component forecasts
From 2000.1 to 2000.4
Observations 4

	1st	2nd	3rd	4th	AVGE
2000	99.604	98.717	100.560	100.770	99.913

```
     GDP constant rupiah at 1 digit level            PAGE   8, SERIES gdp_c

F 3. Monitoring and Quality Assessment Statistics
      All the measures below are in the range from 0 to 3 with an
      acceptance region from 0 to 1.

   1. The relative contribution of the irregular over one          M1  = 0.433
      quarter span (from Table F 2.B).

   2. The relative contribution of the irregular component         M2  = 0.035
      to the stationary portion of the variance (from Table
      F 2.F).

   3. The amount of quarter to quarter change in the irregular     M3  = 0.000
      component as compared to the amount of quarter to quarter
      change in the trend-cycle (from Table F2.H).

   4. The amount of autocorrelation in the irregular as            M4  = 0.480
      described by the average duration of run (Table F 2.D).

   5. The number of quarters it takes the change in the trend-     M5  = 0.200
      cycle to surpass the amount of change in the irregular
      (from Table F 2.E).

   6. The amount of year to year change in the irregular as        M6  = 0.110
      compared to the amount of year to year change in the
      seasonal (from Table F 2.H).

   7. The amount of moving seasonality present relative to         M7  = 0.468
      the amount of stable seasonality (from Table F 2.I).

   8. The size of the fluctuations in the seasonal component       M8  = 0.752
      throughout the whole series.

   9. The average linear movement in the seasonal component        M9  = 0.655
      throughout the whole series.

  10. Same as 8, calculated for recent years only.                 M10 = 0.842

  11. Same as 9, calculated for recent years only.                 M11 = 0.814

         *** ACCEPTED *** at the level   0.37

         *** Q (without M2) =   0.41  ACCEPTED.
```

APPENDIX B
OUTPUT LOG FOR THREE RUNS OF TOTAL GDP

```
Log for X-12-ARIMA (version 0.2.7) seasonal adjustment program
*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*


Type of  Series      Additional                        Series title
Adjust.  Ident.      Identifiers


 Q-MLT    gdp_a   -------- -------- GDP constant rupiah at 1 digit level
 Identifiable seasonality     : yes
   M01 :       0.728
   M02 :       0.076
   M03 :       0.000
   M04 :       0.839
   M05 :       0.200
   M06 :       0.174
   M07 :       0.611
   Q   :       0.524
   Q2  :       0.579

 Q-MLT    gdp_b   -------- -------- GDP constant rupiah at 1 digit level
 Identifiable seasonality     : yes
   M01 :       0.488
   M02 :       0.035
   M03 :       0.000
   M04 :       0.839
   M05 :       0.200
   M06 :       0.001
   M07 :       0.453
   Q   :       0.395
   Q2  :       0.439

 Q-MLT    gdp_c   -------- -------- GDP constant rupiah at 1 digit level
    Automatic model chosen :  (2 1 2)(0 1 1)

 Identifiable seasonality     : yes
   M01 :       0.433
   M02 :       0.035
   M03 :       0.000
   M04 :       0.480
   M05 :       0.200
   M06 :       0.110
   M07 :       0.468
   Q   :       0.367
   Q2  :       0.409
```

APPENDIX C
OUTPUT LOG FOR RUNS OF GDP AT 1 DIGIT ISIC

```
        Log for X-12-ARIMA (version 0.2.7) seasonal adjustment program
        *-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*


Type of  Series      Additional                      Series title
Adjust.  Ident.      Identifiers

 Q-MLT    gdp1    -------- -------- GDP constant rupiah at 1 digit level
    Automatic model chosen : (2 1 2)(0 1 1)

 Identifiable seasonality      : yes
   M01 :       0.261
   M02 :       0.197
   M03 :       0.678
   M04 :       0.659
   M05 :       0.875
   M06 :       0.238
   M07 :       0.262
   Q   :       0.422
   Q2  :       0.450

 Q-MLT    gdp2    -------- -------- GDP constant rupiah at 1 digit level
    Automatic model chosen : (2 1 2)(0 1 1)

 Identifiable seasonality      : yes
   M01 :       0.272
   M02 :       0.134
   M03 :       0.000
   M04 :       0.120
   M05 :       0.200
   M06 :       1.008
   M07 :       0.150
   Q   :       0.135
   Q2  :       0.135

 Q-MLT    gdp3    -------- -------- GDP constant rupiah at 1 digit level
    Automatic model chosen : (2 1 2)(0 1 1)

 Identifiable seasonality      : yes
   M01 :       0.166
   M02 :       0.039
   M03 :       0.025
   M04 :       0.300
   M05 :       0.200
   M06 :       0.264
   M07 :       0.223
   Q   :       0.228
   Q2  :       0.252

 Q-MLT    gdp4    -------- -------- GDP constant rupiah at 1 digit level
    Automatic model chosen : (2 1 2)(0 1 1)

 Identifiable seasonality      : yes
   M01 :       0.059
   M02 :       0.019
   M03 :       0.000
   M04 :       0.659
   M05 :       0.200
   M06 :       0.439
   M07 :       0.117
   Q   :       0.194
   Q2  :       0.216

 Q-MLT    gdp5    -------- -------- GDP constant rupiah at 1 digit level
    Automatic model chosen : (0 1 2)(0 1 1)
```

```
Identifiable seasonality     : yes
  M01 :       0.142
  M02 :       0.017
  M03 :       0.000
  M04 :       0.480
  M05 :       0.200
  M06 :       0.399
  M07 :       0.548
  Q   :       0.289
  Q2  :       0.323

Q-MLT    gdp6   -------- -------- GDP constant rupiah at 1 digit level
   Automatic model chosen : (2 1 2)(0 1 1)

Identifiable seasonality     : yes
  M01 :       0.129
  M02 :       0.014
  M03 :       0.000
  M04 :       0.120
  M05 :       0.200
  M06 :       0.493
  M07 :       0.511
  Q   :       0.469
  Q2  :       0.532

Q-MLT    gdp7   -------- -------- GDP constant rupiah at 1 digit level
   Automatic model chosen : (0 2 2)(0 1 1)

Identifiable seasonality     : yes
  M01 :       0.087
  M02 :       0.009
  M03 :       0.000
  M04 :       0.300
  M05 :       0.200
  M06 :       0.427
  M07 :       0.614
  Q   :       0.408
  Q2  :       0.463

Q-MLT    gdp8   -------- -------- GDP constant rupiah at 1 digit level
   Default model used : none (no model selected)

Identifiable seasonality     : no
  M01 :       0.372
  M02 :       0.048
  M03 :       0.000
  M04 :       0.120
  M05 :       0.200
  M06 :       0.575
  M07 :       1.089
  Q   :       0.880
  Q2  :       0.996

Q-MLT    gdp9   -------- -------- GDP constant rupiah at 1 digit level
   Automatic model chosen : (0 1 2)(0 1 1)

Identifiable seasonality     : yes
  M01 :       0.056
  M02 :       0.020
  M03 :       0.000
  M04 :       0.659
  M05 :       0.200
  M06 :       0.717
  M07 :       0.454
  Q   :       0.395
  Q2  :       0.448

Q-MLT    gdptot -------- -------- GDP constant rupiah at 1 digit level
   Automatic model chosen : (2 1 2)(0 1 1)
```

```
Identifiable seasonality     : yes
   M01 :        0.433
   M02 :        0.035
   M03 :        0.000
   M04 :        0.480
   M05 :        0.200
   M06 :        0.110
   M07 :        0.468
   Q   :        0.367
   Q2  :        0.409

Q-MLT    gdptmg -------- -------- GDP constant rupiah at 1 digit level
    Automatic model chosen : (2 1 2)(0 1 1)

Identifiable seasonality     : yes
   M01 :        0.438
   M02 :        0.031
   M03 :        0.000
   M04 :        0.480
   M05 :        0.200
   M06 :        0.139
   M07 :        0.480
   Q   :        0.380
   Q2  :        0.423
```

APPENDIX D
PRINTOUT FOR SEASONAL ADJUSTMENT OF TOTAL CPI

```
 Reading input spec file from cpi_x01.spc
 Reading data from cpi_tot.txt

1

              U. S. Department of Commerce, U. S. Census Bureau

                X-12-ARIMA monthly seasonal adjustment Method,
                           Release Version 0.2.7


          This method modifies the X-11 variant of Census Method II
          by J. Shiskin A.H. Young and J.C. Musgrave of February, 1967.
         and the X-11-ARIMA program based on the methodological research
          developed by Estela Bee Dagum, Chief of the Seasonal Adjustment
           and Time Series Staff of Statistics Canada, September, 1979.

      Primary Programmers: Brian Monsell, Mark Otto


     Series Title- Consumer price indexes (monthly)
     Series Name- cpi_x01
     08/30/00     12:40:14.52

        -Period covered-  1st month,1990 to  7th month,2000
        -Type of run - multiplicative seasonal adjustment

        -Sigma limits for graduating extreme values are 1.5 and 2.5 .
        -3x3 moving average used in section 1 of each iteration,
         3x5 moving average in section 2 of iterations B and C,
         moving average for final seasonal factors chosen by Global MSR.
        -Trading day irregular regression computed 1990.Janstarting
         excluding irregular values outside  2.50-sigma limits.
        -Trading day irregular regression estimates applied.
        -Trading day irregular regression applied as prior factors.
        -Irregular regression AIC test performed for trading day regressors.
        -Spectral plots generated for selected series
        -Spectral plots generated for series starting in 1992.Aug

    Tables labeled "First pass" are from an initial seasonal adjustment used to estimate
    irregular regression and/or X-11 Easter effects.
```

```
   Consumer price indexes (monthly)            PAGE   1, SERIES cpi_x01

 Contents of spc file cpi_x01.spc

Line #
------
    1: #          File: cpi_x01
    2:
    3: #  Spec to enter data
    4: series          {start=1990.1
    5:          span=(1990.1, 2000.7)
    6:          period=12
    7:          file="cpi_tot.txt"      # illegal with "data"
    8:          title="Consumer price indexes (monthly)"
    9:          decimals=3
   10:            print=(none +header +specfile +a1)      }
   11:
   12: #  Spec for seasonal adjustment:
   13: x11             {seasonalma=msr         # default value
   14:          mode=mult   # illegal with transform "auto"
   15:          sigmalim=(1.5,2.5)       # default value
   16:          print=(none d10 d11 d12 d13 d16 f3)
   17:            savelog =(ids m1 m2 m3 m4 m5 m6 m7 q q2)}
   18:
   19: #  Optional spec to estimate calendar effects:
   20: x11regression    {variables=td
   21:                   sigma=2.50       # default value
   22:                   aictest=td
   23:                   print=(none c16 xaictest)          }
   24:
   25: #  Optional spec for automatic ARIMA model selection
   26: automdl         {mode=fcst         # default value
   27:                  file="d:\x12a\x12b.mdl"
   28:                  method=best             # default is "first"
   29:                  fcstlim=20        # default is 15
   30:                  overdiff=0.95           # default is 0.90
   31:                  print=(none + autochoice)
   32:                  savelog=automodel             }
   33:
   34: #  Spec to transform the data for the ARIMA model
   35: transform       {function=log           # default is "none"
   36:          print=(none)
   37:          savelog=autotransform                 }
   38:
   39: #  Optional spec used to detect outliers in "x11regression"
   40: outlier         {types=(ao ls tc)       # default value
   41:          span=(1997.1, 1999.12)
   42:          critical=(3.75, 3.75, 3.75)
   43:          method=addone           # default value
   44:          print=(none + header)                 }
```

Consumer price indexes (monthly) PAGE 2, SERIES cpi_x01

A 1 Time series data (for the span analyzed)
From 1990.Jan to 2000.Jul
Observations 127

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	TOTAL
1990	58.270 61.900	58.850 62.270	58.620 62.590	59.450 63.230	59.790 63.440	60.570 63.480	732.460
1991	63.960 67.030	64.150 68.310	64.170 68.390	65.390 68.910	65.500 69.640	65.790 69.770	801.010
1992	70.080 72.080	70.260 72.190	70.720 72.340	71.370 72.630	71.450 72.820	71.910 73.300	861.150
1993	75.440 79.060	76.970 79.310	78.110 79.530	78.230 80.000	78.340 80.330	78.530 80.750	944.600
1994	81.760 85.680	83.200 86.440	83.780 86.900	83.990 87.680	84.420 88.070	84.520 88.530	1024.970
1995	89.550 94.050	90.730 94.350	91.240 94.710	92.790 95.320	93.240 95.720	93.390 96.480	1121.570
1996	98.560 100.080	99.860 100.040	99.200 100.220	99.490 100.630	100.130 101.030	99.380 101.380	1200.000
1997	103.290 105.380	104.070 106.330	104.000 107.490	104.420 108.520	104.630 109.870	104.540 111.790	1274.330
1998	119.170 177.970	133.990 189.170	141.060 196.230	147.650 195.690	155.410 195.860	163.080 198.470	2013.750
1999	204.400 201.710	207.010 199.780	206.610 198.400	205.180 198.510	204.610 199.000	203.870 202.450	2431.530
2000	205.120 210.910	205.270	204.340	205.480	207.210	208.240	1446.570
AVGE	106.927 114.168	108.578 105.819	109.259 106.680	110.313 107.112	111.339 107.578	112.165 108.640	

Table Total- 13851.94 Mean- 109.07 Std. Dev.- 49.40
Min - 58.27 Max - 210.91

AICC for model without td -990.2651
AICC for model with td -975.2204

***** AICC (with aicdiff= 0.00) prefers model without td *****
NOTE: Because of the AIC test result, X-12-ARIMA has removed any trading day, stock trading day, or holiday regressors from the irregular component regression model. No further model estimation will be attempted.

Reading model file for automatic model selection from d:\x12a\x12b.mdl

The model chosen is (2 1 1)(0 1 1)

Average absolute percentage error in within-sample forecasts:
Last year: 2.89 Last-1 year: 10.95 Last-2 year: 12.51
Last three years: 8.78

Regression Model

Variable	Parameter Estimate	Standard Error	t-value
Automatically Identified Outliers			
AO1997.Dec	-0.0133	0.00338	-3.94
LS1998.Feb	0.0655	0.00591	11.09
LS1998.Jul	0.0292	0.00561	5.19
LS1998.Oct	-0.0226	0.00566	-3.99

ARIMA Model: (2 1 1)(0 1 1)
Nonseasonal differences: 1
Seasonal differences: 1

Parameter	Estimate	Standard Errors
Nonseasonal AR		
Lag 1	0.1229	0.23136
Lag 2	0.6154	0.20180
Nonseasonal MA		
Lag 1	-0.7605	0.22336
Seasonal MA		
Lag 12	0.7733	0.06926
Variance	0.59763E-04	

Likelihood Statistics

Effective number of observations (nefobs)	104
Number of parameters estimated (np)	9
Log likelihood	386.5770
Transformation Adjustment	-483.2121
Adjusted Log likelihood (L)	-96.6351
AIC	211.2702
AICC (F-corrected-AIC)	213.1851
Hannan Quinn	220.9121
BIC	235.0697

FORECASTING
Origin 2000.Jul
Number 12

Forecasts and Standard Errors of the Transfomed Data

Date	Forecast	Standard Error
2000.Aug	5.363	0.0078
2000.Sep	5.370	0.0166
2000.Oct	5.377	0.0262
2000.Nov	5.381	0.0362
2000.Dec	5.394	0.0466
2001.Jan	5.416	0.0568
2001.Feb	5.430	0.0670
2001.Mar	5.437	0.0771
2001.Apr	5.447	0.0869
2001.May	5.457	0.0965
2001.Jun	5.464	0.1059
2001.Jul	5.477	0.1149

Confidence intervals with coverage probability (0.95000)
On the Original Scale

Date	Lower	Forecast	Upper
2000.Aug	210.071	213.299	216.577
2000.Sep	207.993	214.856	221.946
2000.Oct	205.614	216.429	227.812
2000.Nov	202.404	217.307	233.308
2000.Dec	200.831	219.999	240.997
2001.Jan	201.243	224.950	251.449
2001.Feb	200.114	228.210	260.250
2001.Mar	197.523	229.737	267.206
2001.Apr	195.617	231.950	275.032
2001.May	193.937	234.327	283.129
2001.Jun	191.828	236.062	290.498
2001.Jul	190.991	239.239	299.677

Consumer price indexes (monthly)   PAGE 3, SERIES cpi_x01

A 8 RegARIMA combined outlier component
(AO, LS outliers included)
From 1990.Jan to 2000.Jul
Observations 127

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
1990	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1991	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1992	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1993	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1994	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1995	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1996	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1997	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	91.812	92.940
1998	93.043	99.343	99.343	99.343	99.343	99.343	
	102.282	102.282	102.282	100.000	100.000	100.000	99.717
1999	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000	100.000	100.000	100.000	100.000	100.000	100.000
2000	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000						100.000
AVGE	94.308	94.881	94.881	94.881	94.881	94.881	
	95.148	94.662	94.662	94.434	94.434	94.311	

Table Total- 12027.49   Mean- 94.70   Std. Dev.- 6.10
Min - 91.81   Max - 102.28

A 8.A RegARIMA outlier component
From 2000.Aug to 2001.Jul
Observations 12

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
2000							
		100.000	100.000	100.000	100.000	100.000	100.000
2001	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000						100.000

Consumer price indexes (monthly) PAGE 4, SERIES cpi_x01

A 8.AO RegARIMA AO outlier component
From 1990.Jan to 2000.Jul
Observations 127

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
1990	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000	100.000	100.000	100.000	100.000	100.000	100.000
1991	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000	100.000	100.000	100.000	100.000	100.000	100.000
1992	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000	100.000	100.000	100.000	100.000	100.000	100.000
1993	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000	100.000	100.000	100.000	100.000	100.000	100.000
1994	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000	100.000	100.000	100.000	100.000	100.000	100.000
1995	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000	100.000	100.000	100.000	100.000	100.000	100.000
1996	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000	100.000	100.000	100.000	100.000	100.000	100.000
1997	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000	100.000	100.000	100.000	100.000	98.677	99.890
1998	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000	100.000	100.000	100.000	100.000	100.000	100.000
1999	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000	100.000	100.000	100.000	100.000	100.000	100.000
2000	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000						100.000
AVGE	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000	100.000	100.000	100.000	100.000	99.868	

Table Total- 12698.68 Mean- 99.99 Std. Dev.- 0.12
Min - 98.68 Max - 100.00

Consumer price indexes (monthly) PAGE 5, SERIES cpi_x01

A 8.LS RegARIMA level change outlier component
from 1990.Jan to 2000.Jul
Observations 127

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
1990	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1991	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1992	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1993	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1994	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1995	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1996	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1997	93.043	93.043	93.043	93.043	93.043	93.043	
	93.043	93.043	93.043	93.043	93.043	93.043	93.043
1998	93.043	99.343	99.343	99.343	99.343	99.343	
	102.282	102.282	102.282	100.000	100.000	100.000	99.717
1999	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000	100.000	100.000	100.000	100.000	100.000	100.000
2000	100.000	100.000	100.000	100.000	100.000	100.000	
	100.000						100.000
AVGE	94.308	94.881	94.881	94.881	94.881	94.881	
	95.148	94.662	94.662	94.434	94.434	94.434	

Table Total- 12028.72 Mean- 94.71 Std. Dev.- 6.09
Min - 93.04 Max - 102.28

Consumer price indexes (monthly) PAGE 6, SERIES cpi_x01

D 10 Final seasonal factors
From 1990.Jan to 2000.Jul
Observations 127
Seasonal filter 3 x 5 moving average

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
1990	99.906	100.208	100.302	100.387	99.941	99.905	
	100.236	100.126	99.920	99.791	99.700	99.511	99.994
1991	99.906	100.270	100.332	100.408	99.986	99.896	
	100.220	100.097	99.864	99.750	99.643	99.469	99.987
1992	99.928	100.371	100.380	100.463	100.103	99.905	
	100.191	100.030	99.775	99.677	99.523	99.397	99.979
1993	99.989	100.521	100.425	100.499	100.262	99.925	
	100.169	99.969	99.688	99.600	99.369	99.291	99.975
1994	100.077	100.680	100.455	100.522	100.414	99.938	
	100.163	99.944	99.657	99.534	99.212	99.166	99.980
1995	100.163	100.792	100.487	100.490	100.481	99.915	
	100.174	100.010	99.728	99.547	99.080	99.036	99.991
1996	100.230	100.829	100.499	100.400	100.473	99.897	
	100.195	100.089	99.844	99.579	98.991	98.945	99.998
1997	100.330	100.827	100.472	100.300	100.402	99.869	
	100.202	100.171	99.958	99.633	98.941	98.908	100.001
1998	100.433	100.832	100.436	100.221	100.294	99.854	
	100.186	100.221	100.038	99.668	98.920	98.920	100.002
1999	100.528	100.840	100.421	100.157	100.182	99.804	
	100.152	100.263	100.086	99.716	98.934	98.962	100.004
2000	100.580	100.855	100.407	100.105	100.106	99.782	
	100.118						100.279
AVGE	100.188	100.639	100.420	100.358	100.240	99.881	
	100.182	100.092	99.856	99.650	99.231	99.160	

Table Total- 12700.89 Mean- 100.01 Std. Dev.- 0.47
Min - 98.91 Max - 100.85

D 10.A Final seasonal component forecasts
From 2000.Aug to 2001.Jul
Observations 12

	Jan	Feb	Mar	Apr	May	Jun	
	Jul	Aug	Sep	Oct	Nov	Dec	AVGE
2000							
		100.280	100.109	99.749	98.940	98.983	99.612
2001	100.620	100.877	100.386	100.068	100.082	99.771	
	100.107						100.273

Consumer price indexes (monthly) PAGE 7, SERIES cpi_x01

D 11 Final seasonally adjusted data
From 1990.Jan to 2000.Jul
Observations 127

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	TOTAL
1990	58.325	58.728	58.443	59.221	59.825	60.628	
	61.754	62.191	62.640	63.363	63.631	63.792	732.541
1991	64.020	63.977	63.958	65.124	65.509	65.858	
	66.883	68.244	68.483	69.083	69.890	70.142	801.171
1992	70.131	70.000	70.452	71.041	71.377	71.978	
	71.943	72.168	72.503	72.865	73.169	73.745	861.372
1993	76.449	76.571	77.780	77.841	78.136	78.589	
	78.927	79.335	79.779	80.321	80.840	81.326	944.893
1994	81.697	82.638	83.401	83.554	84.072	84.572	
	85.541	86.488	87.199	88.090	88.770	89.275	1025.296
1995	89.404	90.017	90.798	92.347	92.793	93.470	
	93.886	94.341	94.969	95.753	96.608	97.419	1121.806
1996	98.334	99.039	98.708	99.093	99.658	99.483	
	99.885	99.951	100.376	101.056	102.060	102.461	1200.104
1997	102.950	103.216	103.511	104.107	104.211	104.677	
	105.168	106.149	107.535	108.920	111.046	113.024	1274.515
1998	118.656	132.884	140.447	147.324	154.954	163.319	
	177.639	188.753	196.156	196.343	197.999	200.636	2015.110
1999	203.327	205.286	205.743	204.859	204.238	204.271	
	201.404	199.255	198.230	199.075	201.144	204.574	2431.407
2000	203.937	203.530	203.511	205.264	206.990	208.696	
	210.662						1442.590
AVGE	106.021	107.808	108.796	109.980	111.069	112.322	
	113.972	105.688	106.787	107.487	108.516	109.640	

Table Total- 13850.81 Mean- 109.06 Std. Dev.- 49.38
Min - 58.33 Max - 210.66

Consumer price indexes (monthly) PAGE 8, SERIES cpi_x01

D 12 Final trend cycle
(LS outliers included)
From 1990.Jan to 2000.Jul
Observations 127
Trend filter 9-term Henderson moving average
I/C ratio 0.19

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	TOTAL
1990	58.365 61.394	58.653 62.104	58.989 62.690	59.378 63.159	59.912 63.515	60.625 63.785	732.569
1991	64.025 66.820	64.300 67.628	64.636 68.454	65.041 69.189	65.520 69.724	66.112 70.019	801.469
1992	70.149 72.022	70.268 72.216	70.533 72.437	70.962 72.800	71.415 73.430	71.771 74.319	862.322
1993	75.378 78.942	76.402 79.350	77.216 79.809	77.785 80.292	78.207 80.803	78.572 81.360	944.116
1994	81.958 85.514	82.561 86.395	83.107 87.280	83.589 88.061	84.096 88.672	84.726 89.144	1025.103
1995	89.565 93.914	90.092 94.428	90.838 95.019	91.743 95.763	92.628 96.633	93.349 97.486	1121.457
1996	98.164 99.782	98.642 100.037	98.954 100.498	99.189 101.347	99.405 101.844	99.607 102.453	1199.722
1997	102.912 105.267	103.270 106.123	103.598 107.297	103.923 108.939	104.245 111.258	104.661 114.597	1276.084
1998	119.126 177.895	133.157 186.672	139.933 193.972	147.302 194.885	155.271 198.524	163.841 201.223	2011.801
1999	203.363 201.156	204.850 199.678	205.487 199.006	205.240 199.497	204.298 200.839	202.858 202.227	2428.499
2000	203.124 210.633	203.626	204.189	205.231	206.806	208.699	1442.307
AVGE	106.012 113.940	107.802 105.463	108.862 106.646	109.944 107.373	111.073 108.524	112.257 109.661	

Table Total- 13845.45 Mean- 109.02 Std. Dev.- 49.28
Min - 58.37 Max - 210.63

Consumer price indexes (monthly) PAGE 9, SERIES cpi_x01

D 13 Final irregular component
From 1990.Jan to 2000.Jul
Observations 127

	Jan / Jul	Feb / Aug	Mar / Sep	Apr / Oct	May / Nov	Jun / Dec	S.D.
1990	99.931	100.128	99.075	99.736	99.855	100.004	
	100.586	100.140	99.921	100.322	100.182	100.011	0.351
1991	99.992	99.498	98.951	100.128	99.983	99.616	
	100.093	100.911	100.042	99.846	100.238	100.177	0.454
1992	99.974	99.619	99.885	100.111	99.946	100.289	
	99.890	99.933	100.092	100.090	99.645	99.227	0.291
1993	100.093	100.221	100.730	100.072	99.909	100.022	
	99.980	99.981	99.963	100.036	100.046	99.959	0.226
1994	99.681	100.093	100.354	99.958	99.972	99.818	
	100.031	100.108	99.907	100.033	100.111	100.347	0.165
1995	99.820	99.916	99.956	100.659	100.178	100.129	
	99.971	99.908	99.947	99.990	99.975	99.932	0.212
1996	100.174	100.402	99.751	99.903	100.255	99.875	
	100.103	99.914	99.879	99.910	100.212	100.008	0.189
1997	100.036	99.948	99.916	100.177	99.968	100.016	
	99.906	100.024	100.222	99.988	99.809	98.628	0.411
1998	99.606	99.795	100.367	100.015	99.796	99.681	
	99.856	101.115	101.126	100.748	99.736	99.708	0.557
1999	99.982	100.213	100.125	99.814	99.971	100.697	
	100.123	99.788	99.610	99.789	100.152	101.161	0.429
2000	100.400	99.953	99.668	100.016	100.089	99.998	
	100.014						0.200
S.D.	0.212	0.258	0.519	0.237	0.128	0.284	
	0.196	0.466	0.389	0.274	0.201	0.630	

Table Total- 12701.81 Mean- 100.01 Std. Dev.- 0.34
Min - 98.63 Max - 101.16

Consumer price indexes (monthly) PAGE 10, SERIES cpi_x01

D 16 Combined adjustment factors
From 1990.Jan to 2000.Jul
Observations 127

	Jan / Jul	Feb / Aug	Mar / Sep	Apr / Oct	May / Nov	Jun / Dec	AVGE
1990	99.906	100.208	100.302	100.387	99.941	99.905	
	100.236	100.126	99.920	99.791	99.700	99.511	99.994
1991	99.906	100.270	100.332	100.408	99.986	99.896	
	100.220	100.097	99.864	99.750	99.643	99.469	99.987
1992	99.928	100.371	100.380	100.463	100.103	99.905	
	100.191	100.030	99.775	99.677	99.523	99.397	99.979
1993	99.989	100.521	100.425	100.499	100.262	99.925	
	100.169	99.969	99.688	99.600	99.369	99.291	99.975
1994	100.077	100.680	100.455	100.522	100.414	99.938	
	100.163	99.944	99.657	99.534	99.212	99.166	99.980
1995	100.163	100.792	100.487	100.480	100.481	99.915	
	100.174	100.010	99.728	99.547	99.080	99.036	99.991
1996	100.230	100.829	100.499	100.400	100.473	99.897	
	100.195	100.089	99.844	99.579	98.991	98.945	99.998
1997	100.330	100.827	100.472	100.300	100.402	99.869	
	100.202	100.171	99.958	99.633	98.941	98.908	100.001
1998	100.433	100.832	100.436	100.221	100.294	99.854	
	100.186	100.221	100.038	99.668	98.920	98.920	100.002
1999	100.528	100.840	100.421	100.157	100.182	99.804	
	100.152	100.263	100.086	99.716	98.934	98.962	100.004
2000	100.580	100.855	100.407	100.105	100.106	99.782	
	100.118						100.279
AVGE	100.188	100.639	100.420	100.358	100.240	99.881	
	100.182	100.092	99.856	99.650	99.231	99.160	

Table Total- 12700.89 Mean- 100.01 Std. Dev.- 0.47
Min - 98.91 Max - 100.85

D 16.A Combined adjustment component forecasts
From 2000.Aug to 2001.Jul
Observations 12

	Jan / Jul	Feb / Aug	Mar / Sep	Apr / Oct	May / Nov	Jun / Dec	AVGE
2000							
		100.280	100.109	99.749	98.940	98.983	99.612
2001	100.620	100.877	100.386	100.068	100.082	99.771	
	100.107						100.273

```
Consumer price indexes (monthly)            PAGE  11, SERIES cpi_x01

F 3. Monitoring and Quality Assessment Statistics
     All the measures below are in the range from 0 to 3 with an
     acceptance region from 0 to 1.

  1. The relative contribution of the irregular over three       M1  = 0.060
     months span (from Table F 2.B).

  2. The relative contribution of the irregular component        M2  = 0.003
     to the stationary portion of the variance (from Table
     F 2.F).

  3. The amount of month to month change in the irregular        M3  = 0.000
     component as compared to the amount of month to month
     change in the trend-cycle (from Table F2.H).

  4. The amount of autocorrelation in the irregular as           M4  = 1.261
     described by the average duration of run (Table F 2.D).

  5. The number of months it takes the change in the trend-      M5  = 0.000
     cycle to surpass the amount of change in the irregular
     (from Table F 2.E).

  6. The amount of year to year change in the irregular as       M6  = 0.148
     compared to the amount of year to year change in the
     seasonal (from Table F 2.H).

  7. The amount of moving seasonality present relative to        M7  = 0.802
     the amount of stable seasonality (from Table F 2.I).

  8. The size of the fluctuations in the seasonal component      M8  = 1.228
     throughout the whole series.

  9. The average linear movement in the seasonal component       M9  = 0.716
     throughout the whole series.

 10. Same as 8, calculated for recent years only.                M10 = 1.250

 11. Same as 9, calculated for recent years only.                M11 = 1.215

        *** ACCEPTED *** at the level   0.50

        *** Check the  4 above measures which failed.

        *** Q (without M2) =  0.56  ACCEPTED.
```

COMPARISON
OF IMPLICIT PRICE INDEXES
FOR MANUFACTURING

Report # 13

by
John Kuiper

August, 2000

Statistical Assistance to the Government of Indonesia (STAT) Project
USAID Contract No. PCE-I-00-99-00009-00

TABLE OF CONTENTS

I. INTRODUCTION

This report evaluates the price indexes obtained from the quarterly manufacturing establishment survey undertaken by the Industry Bureau, by comparing them to the implicit deflators for manufacturing GDP. At the level of total manufacturing the commodity-based Wholesale Price Index will also be compared with these two indexes.

II. METHODOLOGY

A. Industry Bureau Quarterly Price Index

This index is derived from the quarterly establishment survey of manufactures. This survey of 1,700 respondents is a sub-set of the Annual Survey of Manufacturing, which covers about 23,000 establishments. The individual commodities produced by each establishment are used to calculate a "growth factor" for the commodity. These growth factors are then aggregated to a growth factor for the establishment. The growth factors for the establishments are then aggregated to obtain price indexes at the 3, 2 and 1-digit levels of the International Standard Industrial Classification (ISIC). One should note that this survey was not designed for the purpose of producing a price index. Rather, it was designed to produce ISIC-level quantity indexes. But since sufficient information was available to also compute implicit ISIC price indexes, these have been computed since the start of the quarterly survey.

It should be kept in mind that price indexes produced by this survey are implicit unit value indexes rather than commodity price indexes. As such these indexes suffer from two conceptual drawbacks:

- unit value indexes do not necessarily cover exactly the same commodities every quarter, as should a proper commodity price index. This may result in unstable behavior from quarter to quarter.

- unit value indexes also may vary when commodity composition changes, even when commodity prices stay the same.

These drawbacks have to be weighted against the substantial advantages that using a price index based on the Industry Bureau survey brings:

- the unit values computed correspond to the same ISIC to which an establishment is assigned in the annual survey and cover the same commodities reported by the establishment in that survey. Commodity-based price indexes, on the other hand, may assign one establishment's commodities to different ISIC's.

- these unit values, which are computed quarterly, rely on exactly the same data reported by establishments and used in computing the quantity index.

- instead of having to match individual commodities between two quarters, an aggregate price index for each ISIC is computed every quarter based on the response in that quarter alone. Thus the computation procedure maximizes the use of data from establishments.

It is worth noting in this regard that the U.S. Census Bureau calculates the Unit Value Relative (UVR) which is a similar index to that constructed from the Industry Bureau data.

B. Wholesale Price Index

The Prices Bureau of BPS publishes a Wholesale Price Index (WPI). This price index measures the monthly change in particular commodity prices. The weights used to calculate the WPI is the net margin for the commodities marketed by wholesalers, or if appropriate, the producers. The aggregation scheme is therefore not based on the ISIC.

The Wholesale Price Index and the Consumer Price Index used to be the cornerstone of price reporting by many statistical offices. However, with the increasing importance of the manufacturing sector, and in recent years the greater importance of alternative channels of distribution, it has become more common to find industries where the wholesale trade sector has lost its prominence. This is one of the reasons why more and more countries are replacing the WPI with a Producer Price Index (PPI). The difference between these two indexes is that a pure WPI uses *commodity* weights as the basis for aggregating lower level indexes, while the PPI uses *industry* weights based on the ISIC.

In the United States, the Bureau of Labor Statistics (BLS) produces a Producer Price Index. This index was known until 1978 as the Wholesale Price Index. The PPI measures average changes in selling prices received by domestic producers for their output. The indexes reflect the price trends of a constant set of goods and services which represent the total output of an industry. As theses indexes are based on the ISIC, they provide comparability with many industry-based economic time series, such as series on production, employment, wages, earnings, and productivity.

At the lowest level of aggregation, i.e. the 5-digit ISIC and the International Standard Commodity Classification (ISCC), there may be a one-to-one relationship between the ISIC and the ISCC. However, at higher levels of aggregation this will no longer be true. This implies that at higher levels of aggregation it will be difficult to match WPI indexes with ISIC-based volume or value measures.

C. National Accounts Deflators

For the final estimates of GDP at the 3-digit ISIC level of manufacturing, the Production Accounts Bureau uses data from the Annual Survey of Manufacturing. The implicit deflator from the Annual Survey is then used as an deflator/inflator. This data is only avalable `with a considerable time lag. For the preliminary estimates of quarterly GDP at the 3-digit ISIC level a wide variety of deflators/inflators are used. In those cases where series from the quarterly Industry Bureau survey are used to estimate current or constant values, it might be advisable to use deflators/inflators from the same survey. With this approach there would be less likelihood of inappropriate deflators being applied. Also there might well be a greater level of consistency between the preliminary and final estimates, in so far as the deflators from the quarterly Industry Bureau survey are based on a subset of establishments from the Annual Industry Bureau Survey.

III. RESULTS

For purposes of comparison, the implicit GDP deflators for manufacturing (excluding migas) were calculated. These were compared with data from the WPI and the Industry Bureau implicit price indexes, on both an annualized and a quarterly basis.

A. Annual Indexes

At the level of total manufacturing, the Industry Bureau Price Index and the WPI may be compared with the implicit GDP deflator for Total Manufacturing. Data were obtained for the six-year period 1994 to 1999. Comparing the year-to-year growth rate for the Wholesale Price Index and the Industry Bureau deflator, it is found that for three years the WPI is closer to the growth rate for the GDP deflator, while for the other three years the Industry Bureau growth rate was closer. The data is presented in Table 1. For Total Manufacturing the Industry Bureau price index and the GDP deflator show quite similar behavior, except in 1997 and 1999. In both these years the Industry Bureau deflator shows a lower level of inflation.

At the 2-digit ISIC level, WPI indexes were not available. Therefore comparisons were only made between the level of the Implicit GDP deflator and the Industry Bureau deflator. The data used are shown in Table 2. Charts of the levels, the annual percentage changes, and the ratio between the two indexes for total manufacturing are presented in Figure 1. These same charts are presented for the nine 2-digit level industries in Appendix A.

At the 2-digit level the differences between the indexes become larger. Note, for example, ISIC 32 (Textiles, Textile Products and Leather), ISIC 34 (Paper, Printing and Publishing) and ISIC 37 (Basic Metals). Other 2-digit ISIC industries show annual movements with smaller differences.

September 4, 2000 Comparison of Implicit Price Indexes for Manufacturing

TABLE 1 - COMPARISON OF PRICE INDEXES FOR TOTAL MANUFACTURING

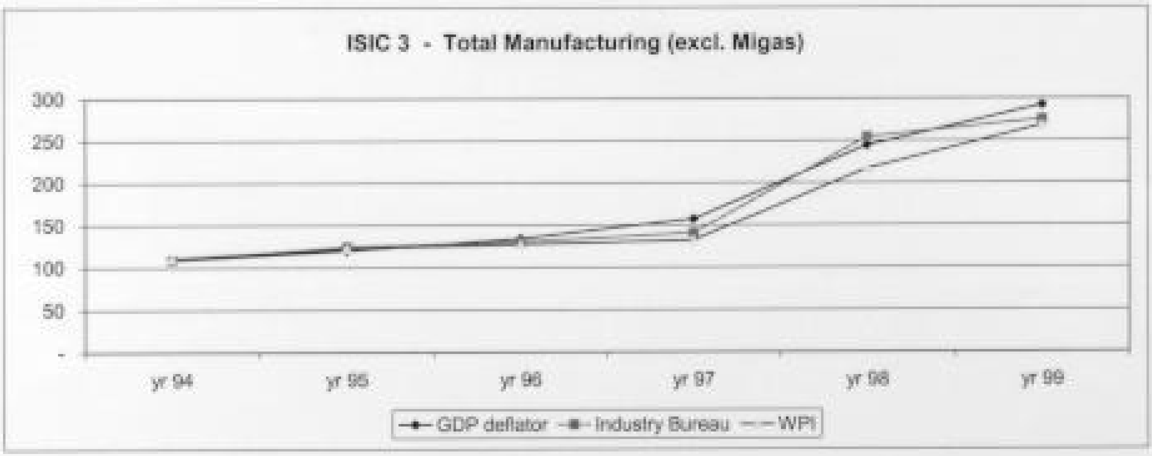
Total Manufacturing	1993	1994	1995	1996	1997	1998	1999
Price Indexes - level							
Industry Bureau - implicit price indexes	100,0	109,1	124,6	130,1	140,4	254,3	275,1
Wholesale Price Indexes (1983=100)		231,0	256,0	265,0	275,0		
Wholesale Price Indexes (1993=100)					132,0	216,7	268,1
Wholesale Price Indexes (1993=100)	100,0	110,9	122,9	127,2	132,0	216,7	268,1
GDP - implicit deflator (incl. Migas)	100,0	109,0	118,7	133,4	156,3	249,8	291,3
GDP - implicit deflator (excl. Migas)	100,0	108,9	120,1	133,7	157,3	244,1	281,5
Price Indexes - % change							
Industry Bureau Deflator		9,1%	14,3%	4,4%	7,9%	81,2%	8,2%
Wholesale Price Index		10,9%	10,8%	3,5%	3,8%	64,2%	23,7%
GDP - implicit deflator (excl. Migas)		8,9%	10,3%	11,4%	17,6%	55,2%	15,3%
Price Indexes - % difference							
Industry Bureau Deflator vs Wholesale Price Index		-1,6%	1,4%	2,3%	6,4%	17,3%	2,6%
Industry Bureau Deflator vs GDP implicit deflator		0,2%	3,8%	-2,7%	-10,6%	4,2%	-5,7%
Wholesale Price Index vs GDP implicit deflator		1,8%	2,3%	-4,9%	-16,1%	-11,2%	-8,1%

TABLE 2 - COMPARISON OF PRICE INDEXES FOR MANUFACTURING AT THE 2 DIGIT LEVEL

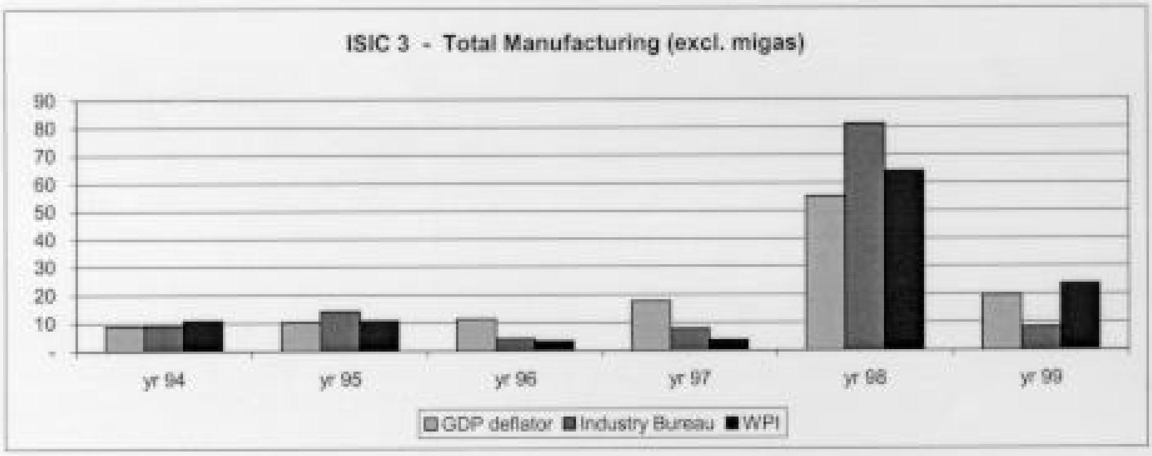
Manufacturing - 2 digit level	1993	1994	1995	1996	1997	1998	1999
GDP Implicit Deflators							
Total Manufacturing (excl. Migas)	100,0	108,9	120,1	133,7	157,3	244,1	291,8
Food, Beverages and Tobacco	100,0	112,0	124,5	130,8	142,1	241,3	305,4
Textiles, Textile Products and Leather	100,0	104,3	112,5	132,6	200,5	236,7	244,4
Wood and Wood Products	100,0	106,9	116,4	137,9	153,1	247,8	260,9
Paper, Printing and Publishing	100,0	108,3	114,2	123,3	151,7	225,0	252,3
Chemicals and Chemical Products	100,0	111,0	125,4	136,0	147,3	241,2	255,2
Non Metallic Mineral Products	100,0	104,5	115,0	132,9	155,3	230,8	233,0
Basic Metals	100,0	99,8	108,1	145,7	183,4	287,4	317,8
Fabricated Metal Products	100,0	105,3	113,8	142,1	199,0	208,8	384,9
Other Manufacturing Industries	100,0	110,0	116,8	130,3	172,1	195,6	200,6
Industry Bureau Deflator							
Total Manufacturing	100,0	109,1	124,6	130,1	140,4	254,3	275,1
Food, Beverages and Tobacco	100,0	109,8	121,9	131,1	147,3	233,7	273,8
Textiles, Textile Products and Leather	100,0	106,0	120,2	127,8	139,3	281,0	251,2
Wood and Wood Products	100,0	110,4	124,5	142,9	156,4	286,1	318,5
Paper, Printing and Publishing	100,0	113,2	154,8	159,2	175,2	380,3	434,9
Chemicals and Chemical Products	100,0	110,1	127,8	132,6	138,2	240,3	251,6
Non Metallic Mineral Products	100,0	110,8	133,7	130,1	136,4	178,2	196,7
Basic Metals	100,0	106,2	121,0	121,8	136,9	309,2	259,0
Fabricated Metal Products	100,0	108,3	120,5	119,1	123,1	242,5	290,0
Other Manufacturing Industries	100,0	107,7	115,9	125,0	136,2	245,7	237,8
GDP Implicit Deflators - % change							
Total Manufacturing (excl. Migas)		8,9%	10,3%	11,4%	17,6%	55,2%	19,5%
Food, Beverages and Tobacco		12,0%	11,1%	5,0%	8,7%	69,8%	26,6%
Textiles, Textile Products and Leather		4,3%	7,8%	17,8%	51,2%	18,1%	3,2%
Wood and Wood Products		6,9%	8,9%	18,5%	11,0%	61,8%	5,3%
Paper, Printing and Publishing		8,3%	7,5%	8,0%	23,0%	48,3%	12,2%
Chemicals and Chemical Products		11,0%	13,0%	8,5%	8,3%	63,7%	5,8%
Non Metallic Mineral Products		4,5%	10,1%	15,6%	16,8%	48,6%	0,9%
Basic Metals		-0,2%	8,3%	34,8%	25,9%	56,8%	10,6%
Fabricated Metal Products		5,3%	8,1%	24,8%	40,1%	14,1%	34,2%
Other Manufacturing Industries		10,0%	6,0%	11,7%	32,1%	13,6%	2,6%
Industry Bureau Deflator - % change							
Total Manufacturing		9,1%	14,3%	4,4%	7,9%	81,2%	8,2%
Food, Beverages and Tobacco		9,8%	11,0%	7,5%	12,4%	58,7%	17,1%
Textiles, Textile Products and Leather		6,0%	13,4%	6,3%	9,0%	80,5%	-1,1%
Wood and Wood Products		10,4%	12,8%	14,7%	9,5%	82,9%	11,3%
Paper, Printing and Publishing		13,2%	36,7%	2,8%	10,1%	117,1%	14,4%
Chemicals and Chemical Products		10,1%	16,0%	3,8%	4,2%	73,0%	4,7%
Non Metallic Mineral Products		10,8%	20,7%	-2,7%	4,9%	30,6%	10,3%
Basic Metals		6,2%	13,9%	0,7%	12,4%	125,8%	-16,0%
Fabricated Metal Products		8,3%	11,3%	-1,1%	3,4%	96,9%	19,6%
Other Manufacturing Industries		7,7%	7,6%	7,8%	9,0%	80,2%	-3,2%
Industry Bureau Deflator and GDP implicit deflator - % difference							
Total Manufacturing		0,2%	3,8%	-2,7%	-10,8%	4,2%	-5,7%
Food, Beverages and Tobacco		-1,9%	-2,1%	0,2%	3,7%	-3,1%	-10,4%
Textiles, Textile Products and Leather		1,6%	6,9%	-3,7%	-30,5%	11,5%	6,0%
Wood and Wood Products		3,3%	7,0%	3,6%	2,1%	15,5%	22,1%
Paper, Printing and Publishing		6,5%	35,5%	29,1%	15,5%	69,0%	72,4%
Chemicals and Chemical Products		-0,8%	1,9%	-2,5%	-6,2%	-0,4%	-1,4%
Non Metallic Mineral Products		6,0%	16,2%	-2,1%	-12,1%	-22,8%	-15,6%
Basic Metals		6,5%	11,9%	-16,4%	-25,3%	7,6%	-18,2%
Fabricated Metal Products		2,9%	5,9%	-16,1%	-38,1%	-15,4%	-24,7%
Other Manufacturing Industries		-2,1%	-0,6%	-4,1%	-20,8%	25,6%	18,6%

FIGURE 1

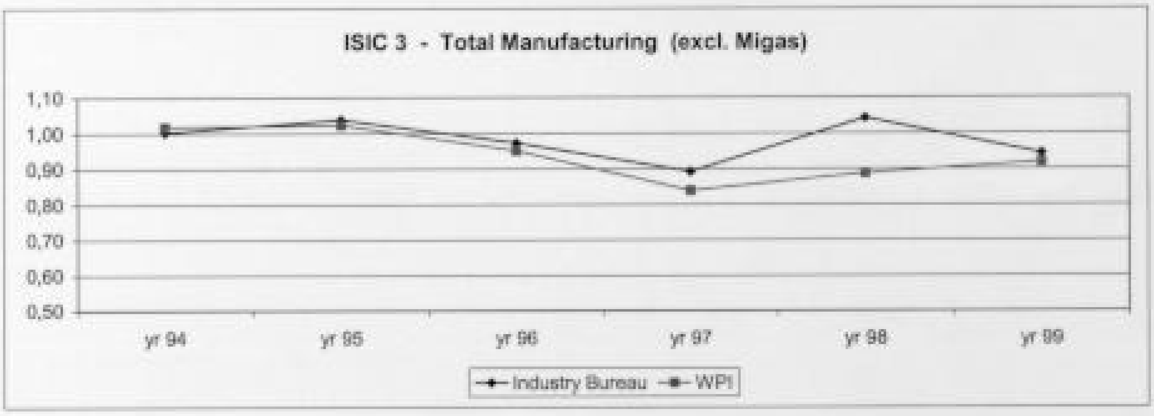
Level of the GDP deflator, the Industry Bureau Price Index and the WPI:



Rate of Change of the GDP deflator, the Industry Bureau Price Index and the WPI:



Ratio of the Industry Bureau Price Index and the WPI to the GDP deflator:



B. Quarterly Indexes

The differences between the Industry Bureau series and the GDP deflator were also evaluated using quarterly data. Charts of the levels, the quarter-to-quarter percentage changes, and the ratio between the two indexes for total manufacturing are presented in Table 2. These same charts are presented for the nine 2-digit level industries in Appendix B.

1. Difference in Levels

As is to be expected, for quarterly data the differences in the level of the indexes are more pronounced than for annual data. Note, for example, the large decreases in the GDP deflator between Q1 1999 and Q2 1999 for ISIC 33 (Wood and Wood Products); ISIC 34 (Paper, Printing and Publishing) and ISIC 38 (Fabricated Metal Products). Also to be noted are several large differences in level for some of the 2-digit price indexes. For example, for ISIC 34 (Paper, Printing and Publishing) the level in Q3 1998 of the Industry Bureau index is 444.5 and the level of the GDP deflator is 239.6, a difference of 85.6%. During Q1 1997 the Industry Bureau index for ISIC 38 (Fabicated Metal Products) has a level of 114.2 and the GDP deflator a level of 204.0, a difference of -44.0 per cent.

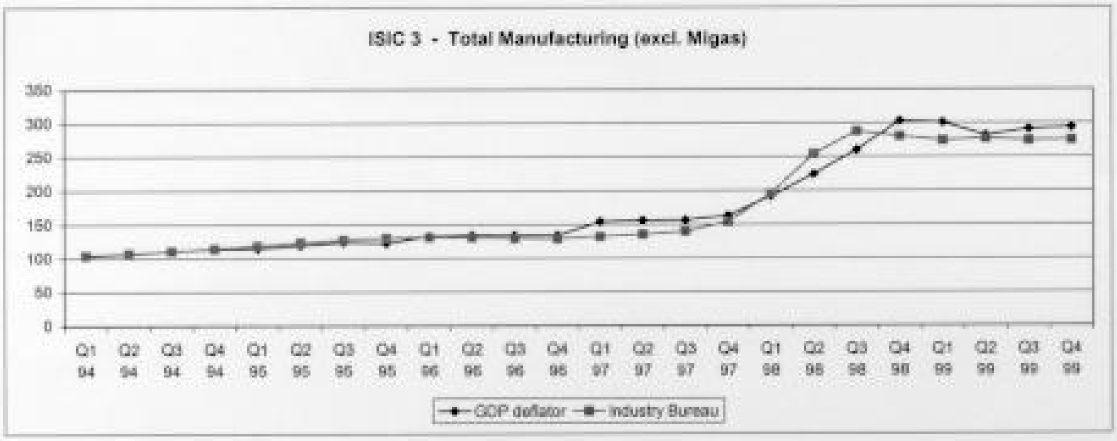
2. Difference in Growth Rates

To measure the extent to which the differences in the quarter-to-quarter growth rates for the nine 2-digit ISIC series are randomly distributed, one can observe the differences in growth rates over time. If these differences were randomly distributed, one would expect that in the majority of quarters three to six growth rates for the Industry Bureau would exceed or be lower than the growth rates for the GDP deflator. In fact the distribution is much more skewed.

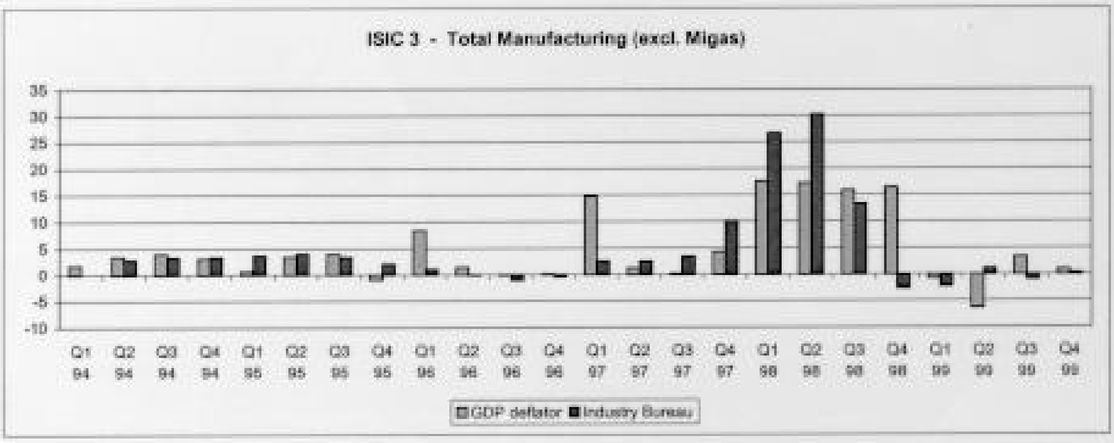
For the period Q1 1994 to Q4 1999 we have a total of 24 observations. In Q1 1996 all nine growth rates are lower, in Q2 1998 all nine growth rates are higher, while for Q4 1995, Q4 1997 and Q1 1998, eight 2 digit industries have higher quarter-to-quarter growth rates, and for Q1 1997, Q4 1998 and Q3 1999 eight 2 digit Industry Bureau indexes have lower quarter-to-quarter growth rates. It appears thus that these differences are systematic rather than random.

FIGURE 2

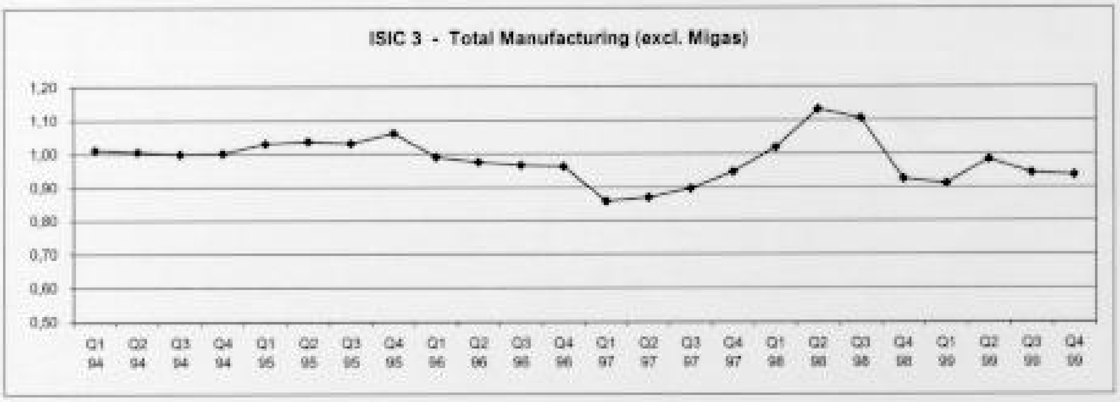
Level of the GDP deflator and the Industry Bureau Price Index:



Rate of Change of the GDP deflator and the Industry Bureau Price Index:



Ratio of the Industry Bureau Price Index to the GDP deflator:



IV. CONCLUDING REMARKS

The above comparisons provide BPS with an opportunity to evaluate the plausibility as well as the consistency of data from the above three sources. One strong recommendation, therefore, is that a similar comparison to the one in this report be conducted regularly within BPS to evaluate these data sources. The following needs to be kept in mind:

- Since the GDP deflator covers small establishments and cottage industries in manufacturing while the Industry Bureau index covers only large and medium establishments, differences between the two indexes may always exist. However, it might be possible to obtain the GDP data separately for these two groupings, so that possible differences in pricing may be accounted for.

- The analysis in this report has been undertaken at the 2-digit ISIC level. Performing this analysis at the 3-digit level will pinpoint the ISIC codes for which differences occur.

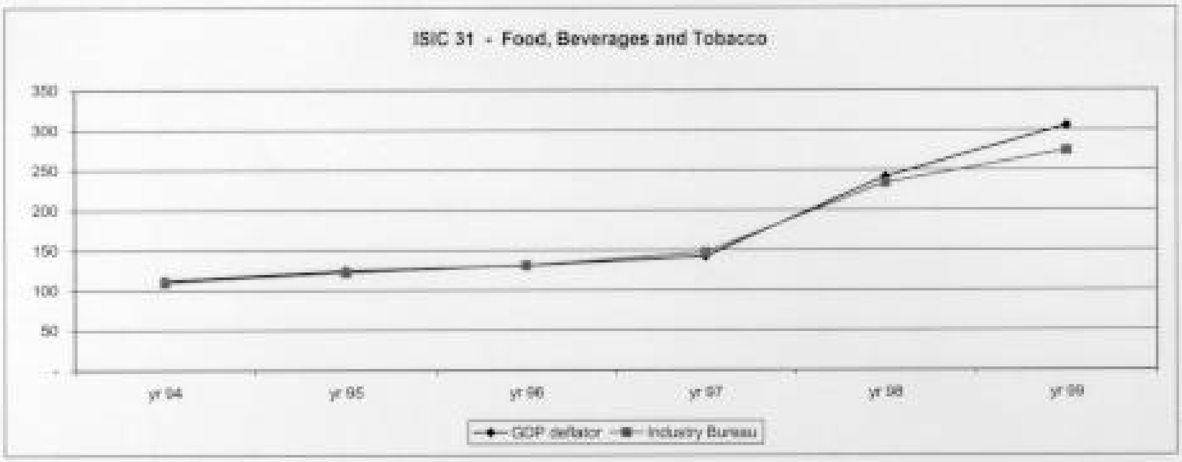
- The price indexes from the Annual Survey of Manufacturing may need to be compared with those from the quarterly Industry Bureau survey. This will indicate the extent to which the quarterly indexes can be used as indicators of the annual indexes.

- At the 3-digit ISIC level, the commodities which are included in the Wholesale Price Index used as deflators/inflators for GDP may be checked to verify the extent to which they cover the commodities included in that 3-digit ISIC industry.

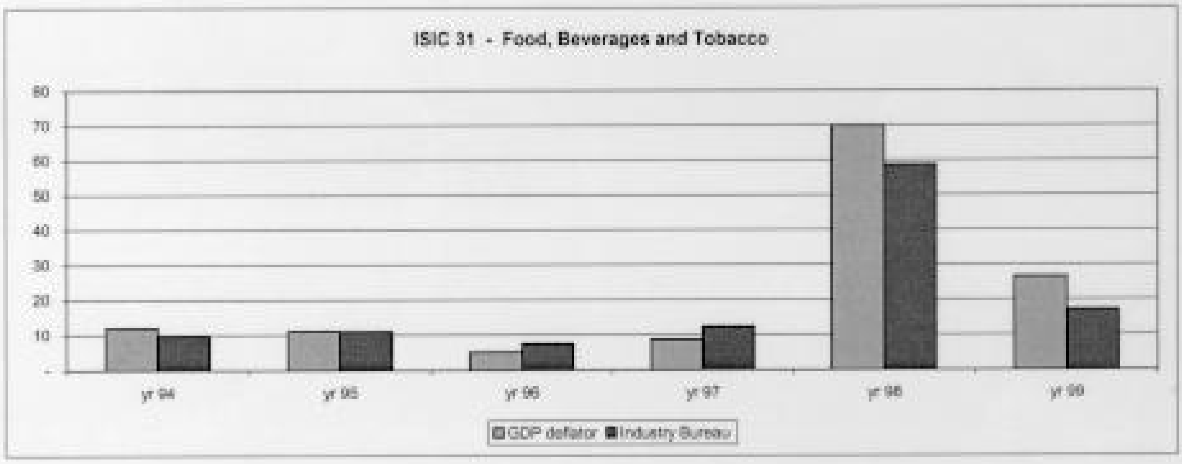
APPENDIX A
ANNUALIZED DATA BY 2-DIGIT ISIC

FIGURE A.1

Level of the GDP deflator and the Industry Bureau Price Index:



Rate of Change of the GDP deflator and the Industry Bureau Price Index:



Ratio of the Industry Bureau Price Index to the GDP deflator:

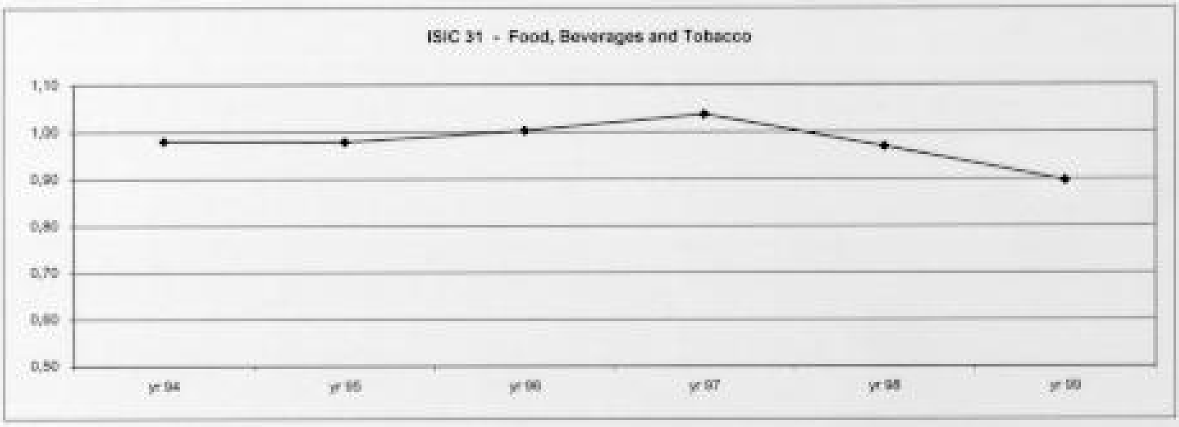
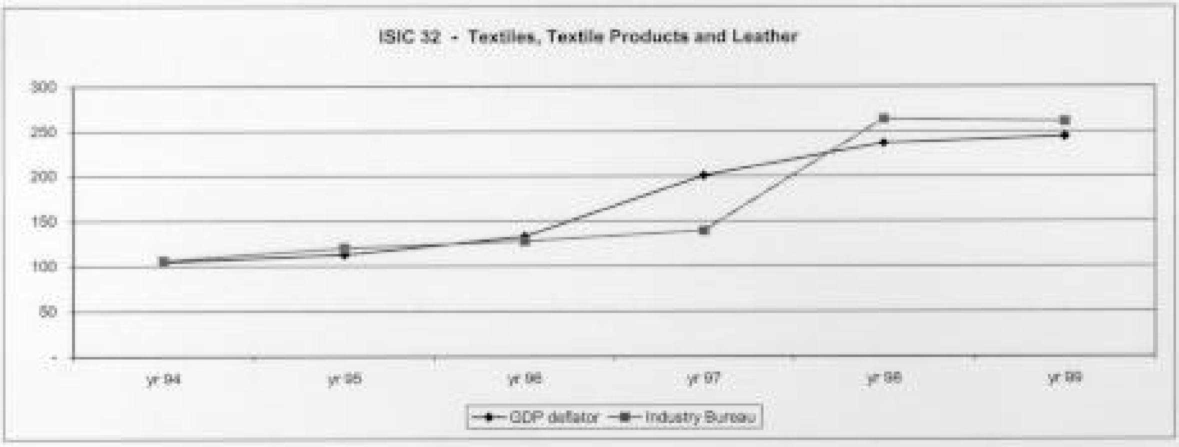
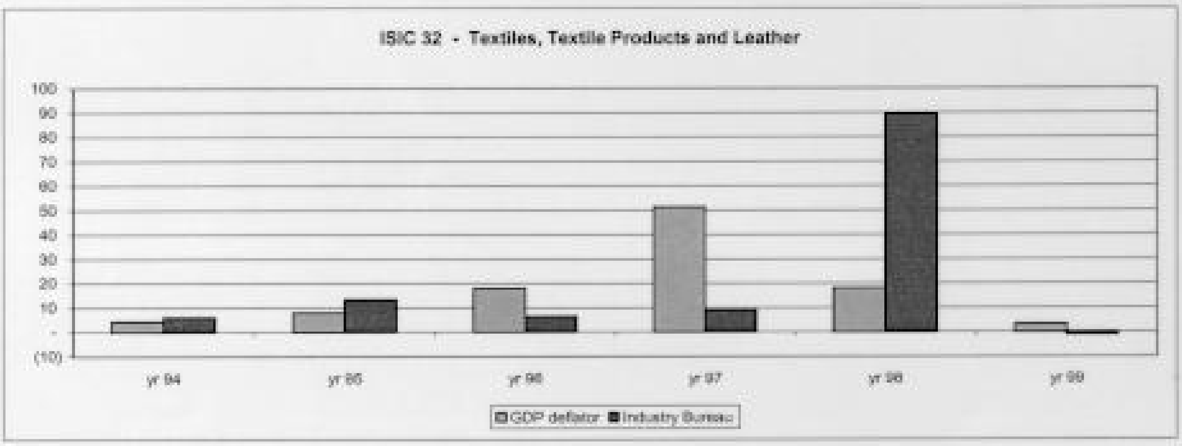


FIGURE A.2

Level of the GDP deflator and the Industry Bureau Price Index:



Rate of Change of the GDP deflator and the Industry Bureau Price Index:



Ratio of the Industry Bureau Price Index to the GDP deflator:

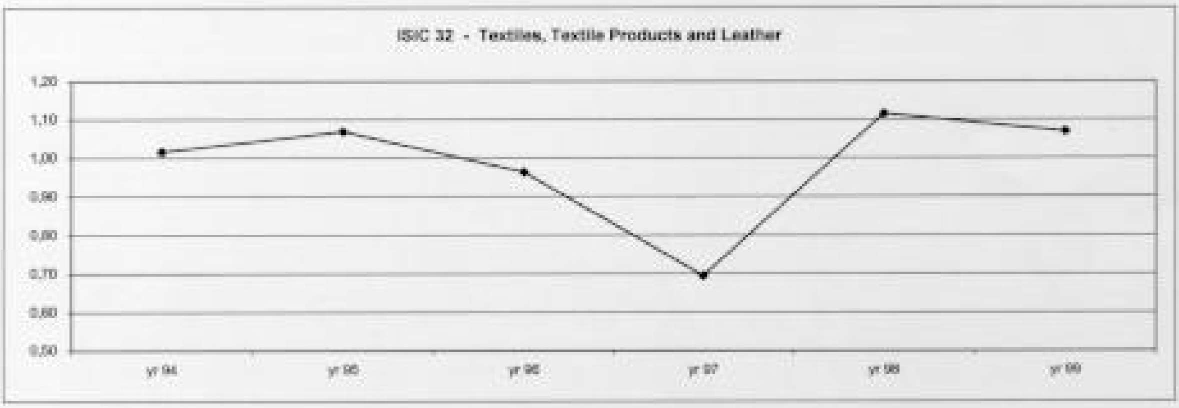
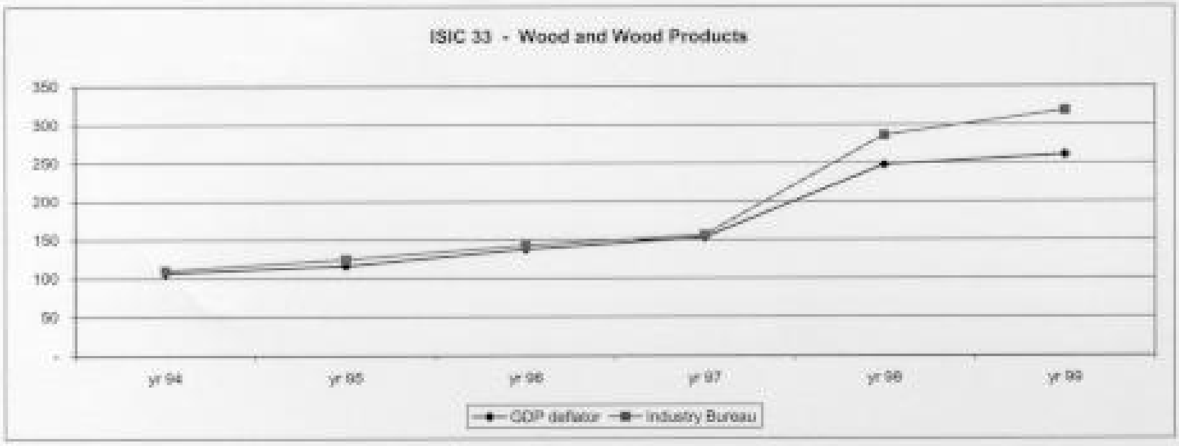


FIGURE A.3

Level of the GDP deflator and the Industry Bureau Price Index:



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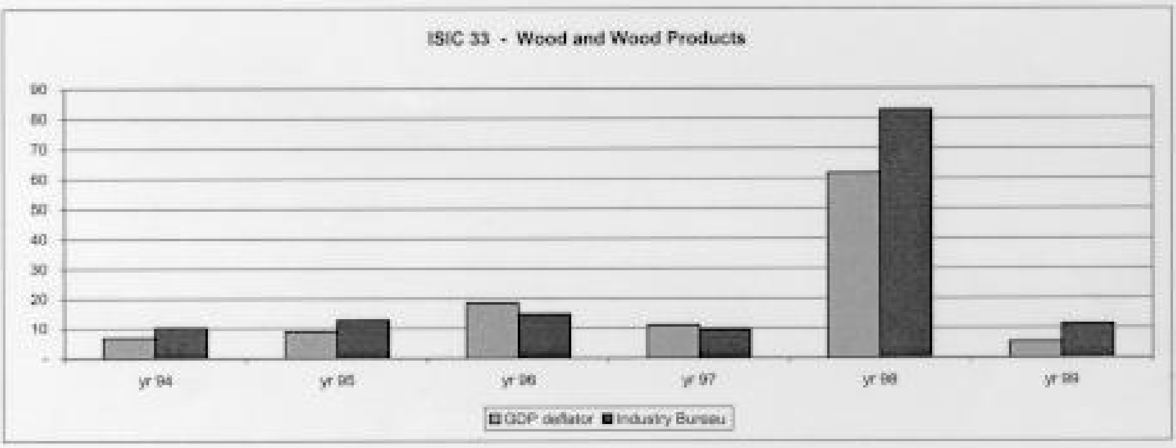

Ratio of the Industry Bureau Price Index to the GDP deflator:

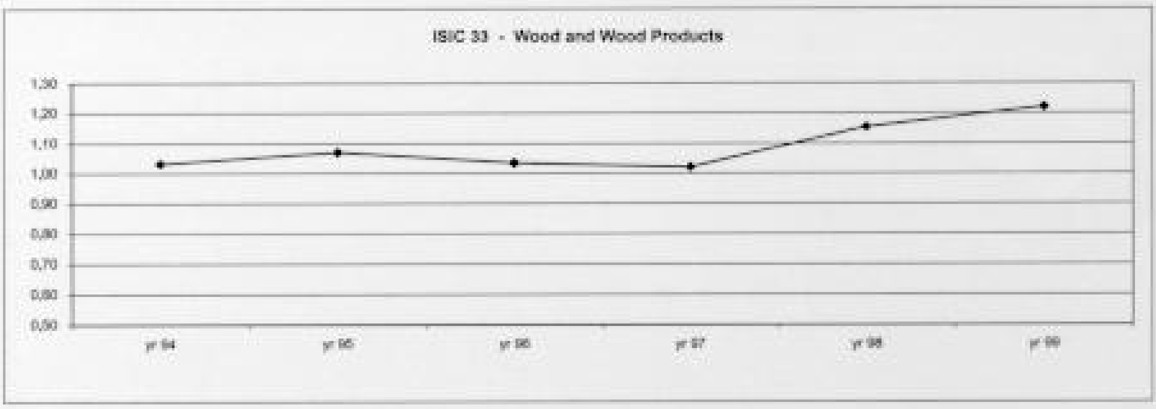

FIGURE A.4

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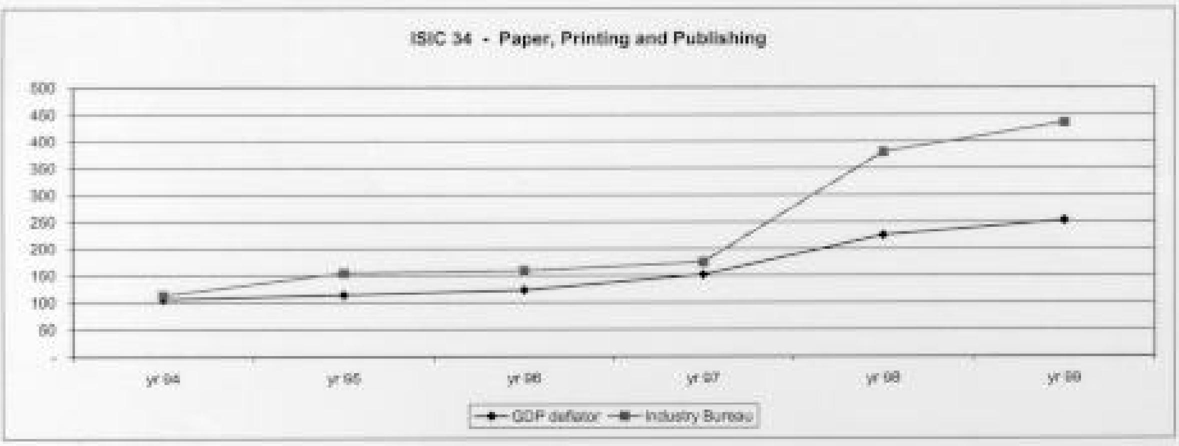

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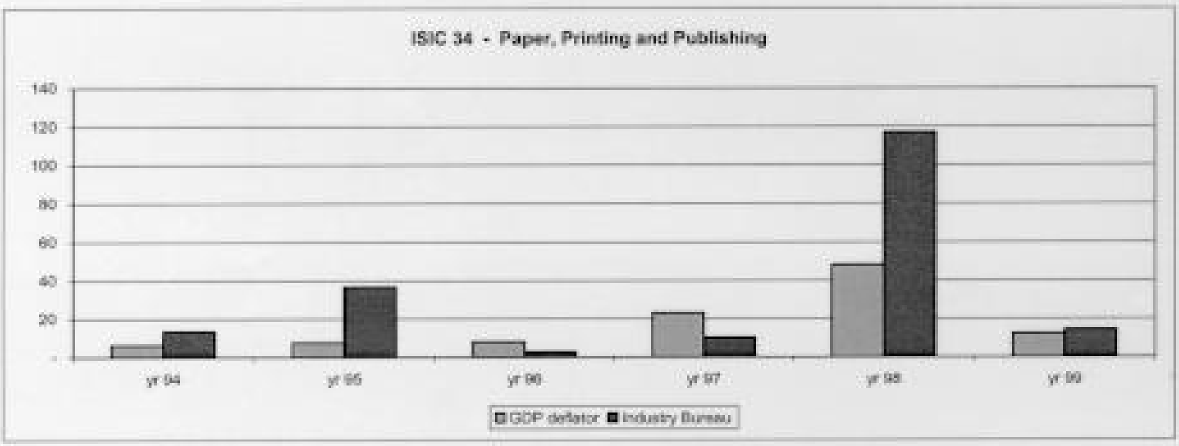
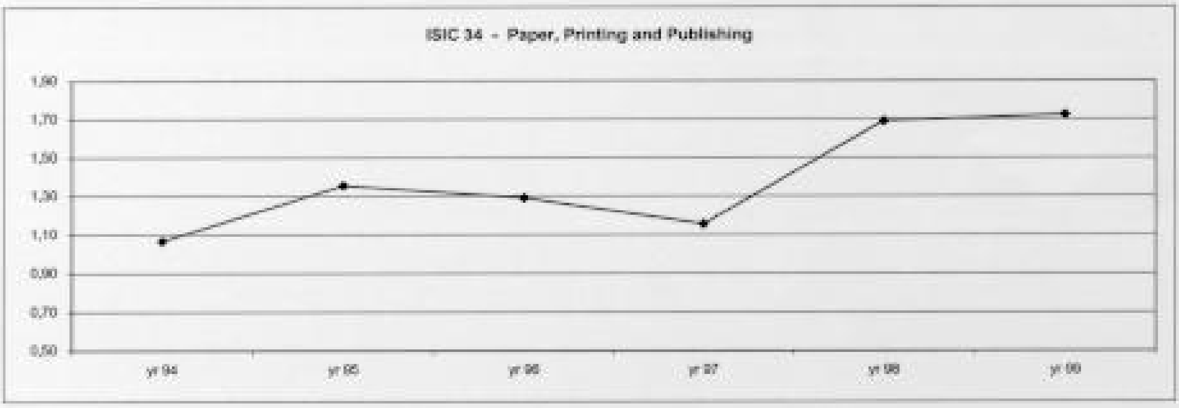


Ratio of the Industry Bureau Price Index to the GDP deflator:



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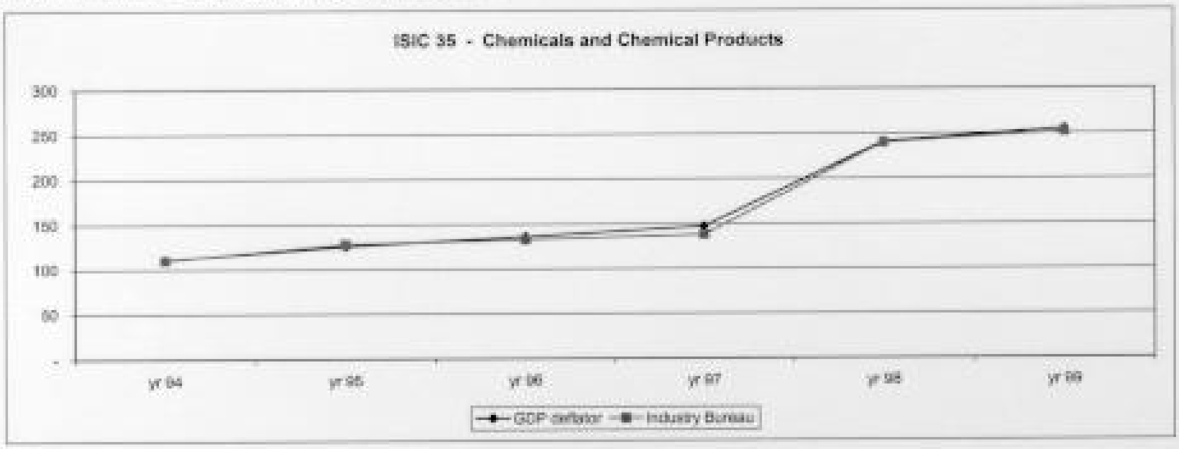
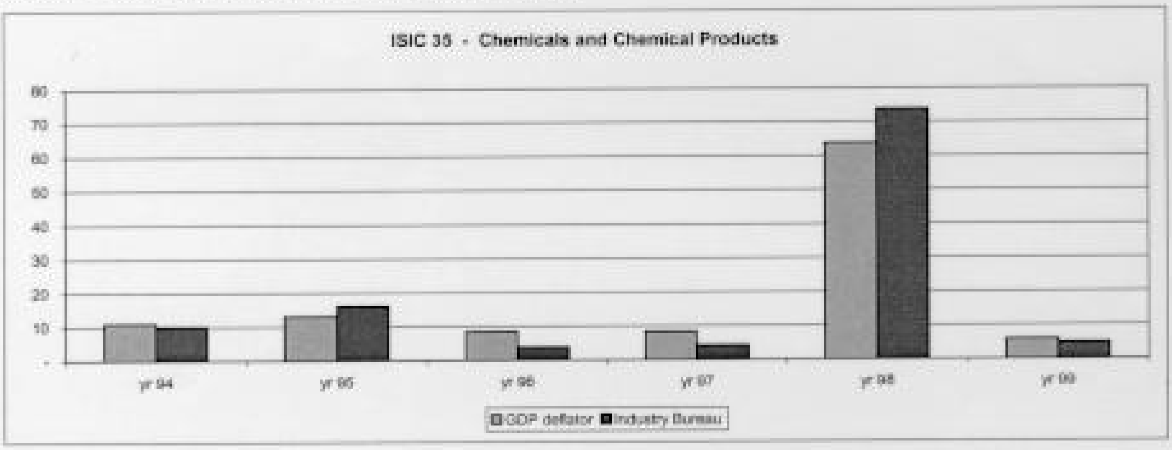


Rate of Change of the GDP deflator and the Industry Bureau Price Index:



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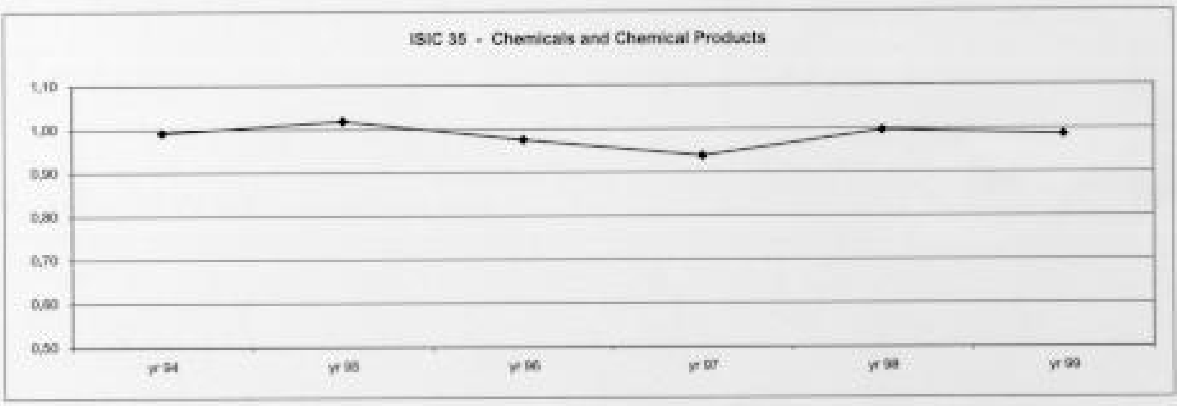

FIGURE A.6

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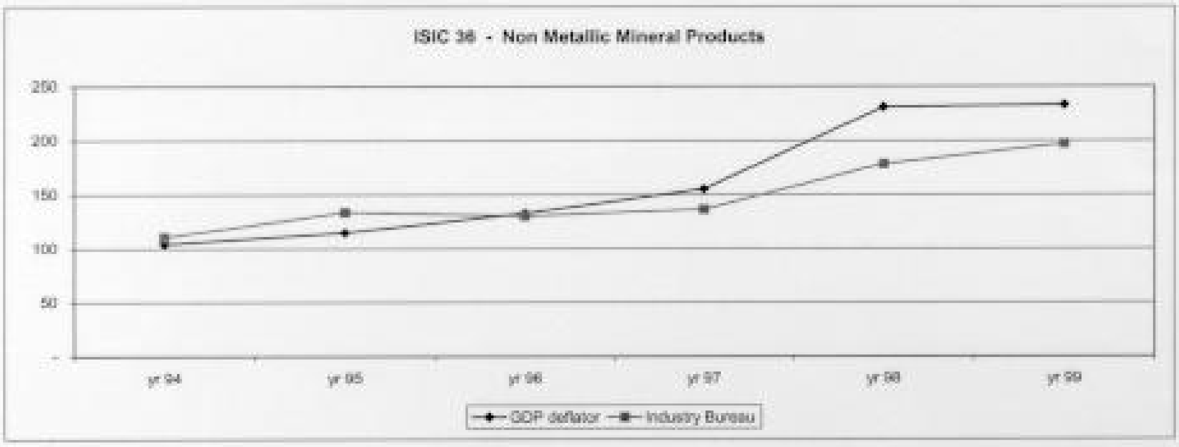

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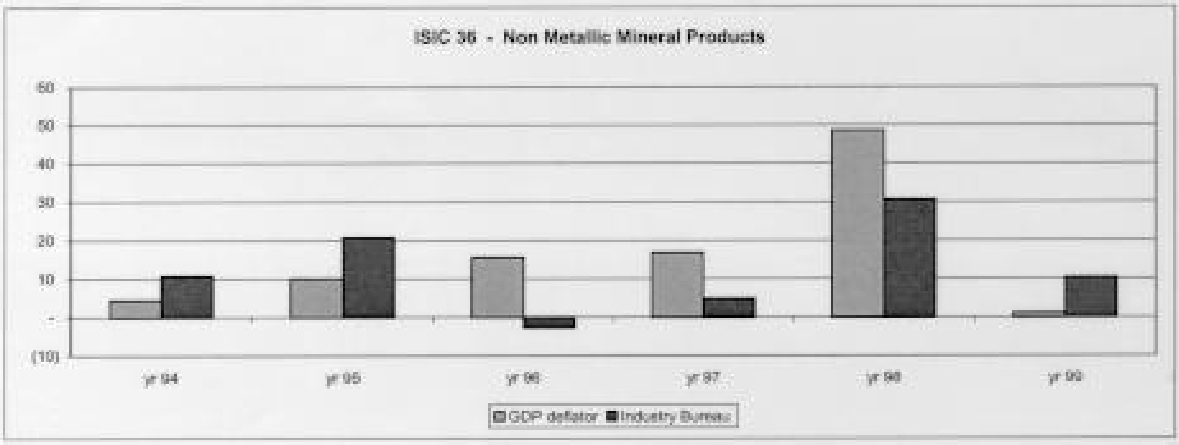


Ratio of the Industry Bureau Price Index to the GDP deflator:

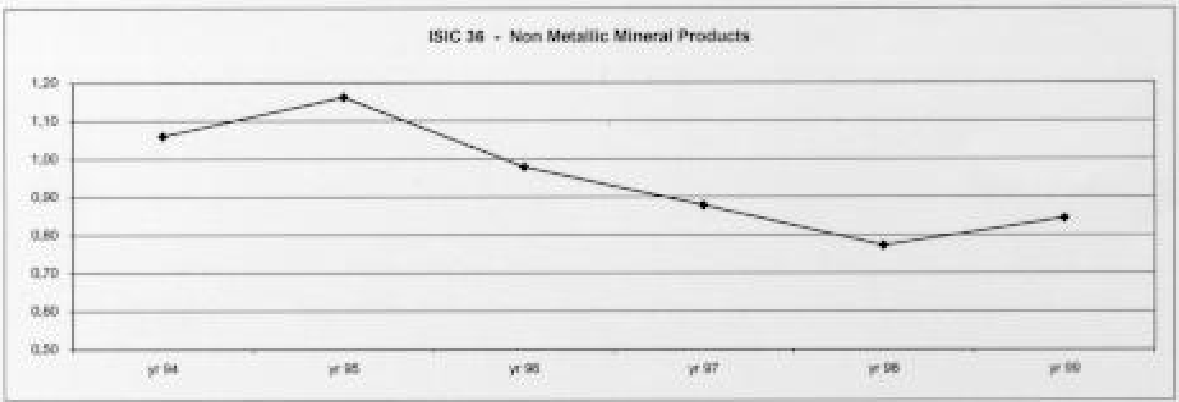
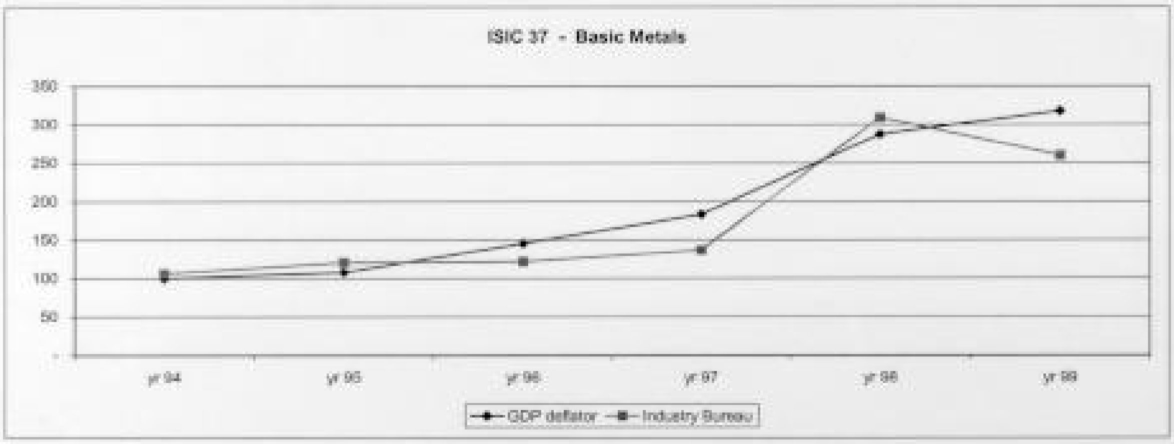
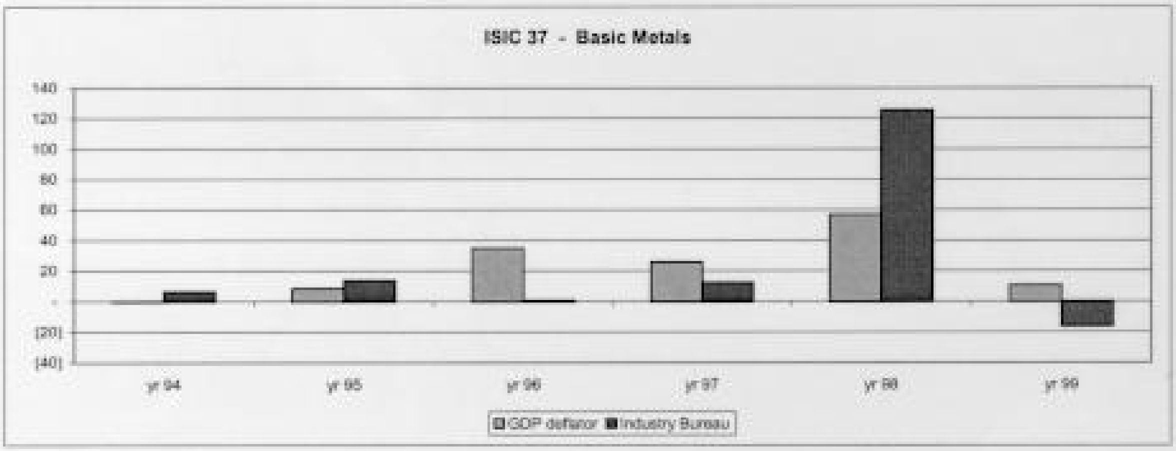


FIGURE A.7

Level of the GDP deflator and the Industry Bureau Price Index:



Rate of Change of the GDP deflator and the Industry Bureau Price Index:



Ratio of the Industry Bureau Price Index to the GDP deflator:

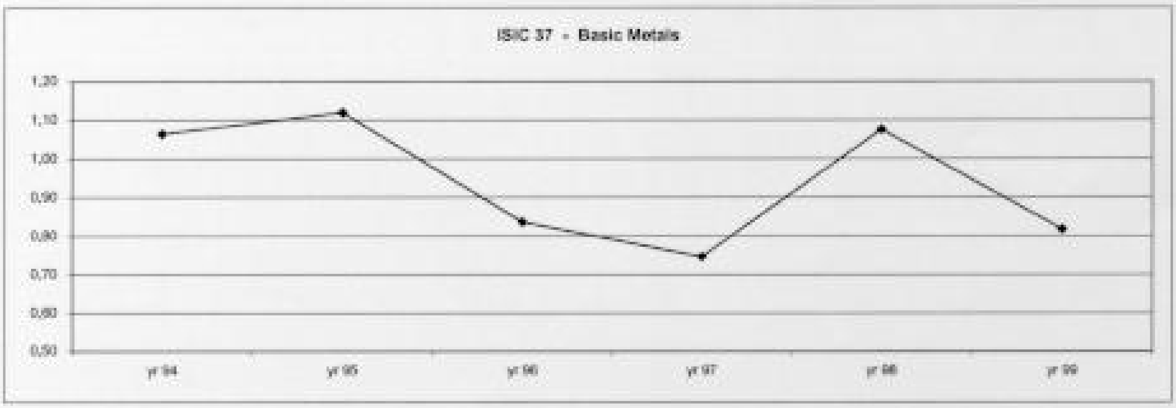
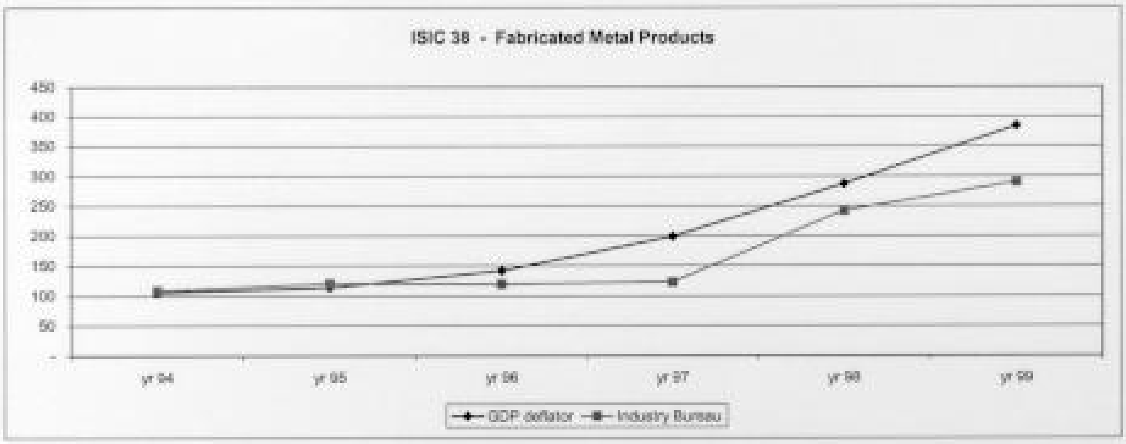
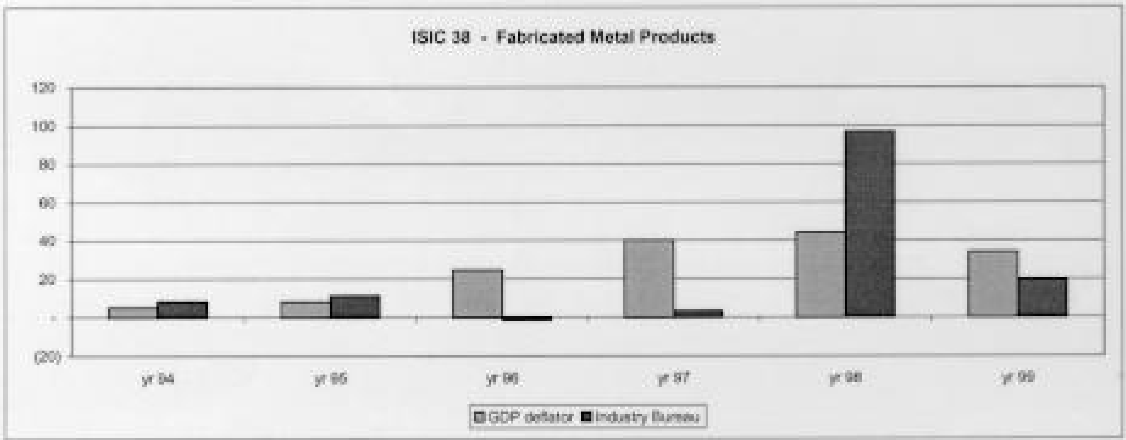


FIGURE A.8

Level of the GDP deflator and the Industry Bureau Price Index:



Rate of Change of the GDP deflator and the Industry Bureau Price Index:



Ratio of the Industry Bureau Price Index to the GDP deflator:

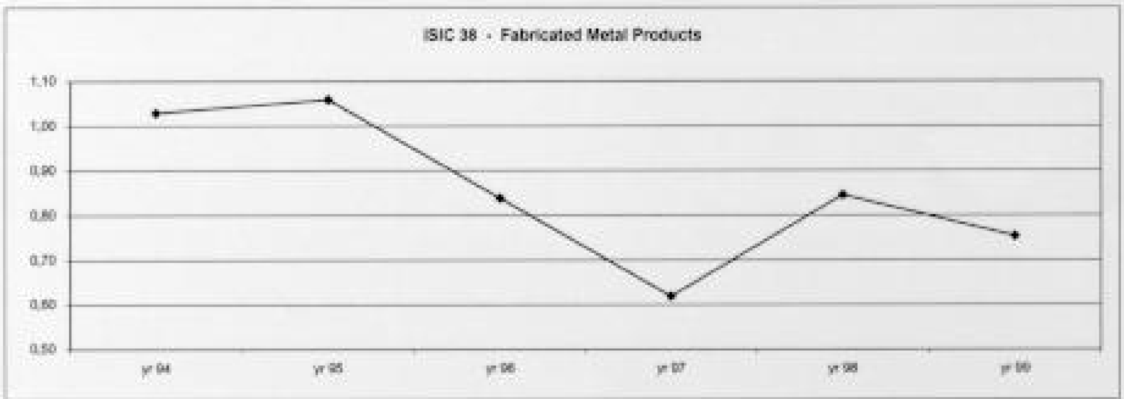
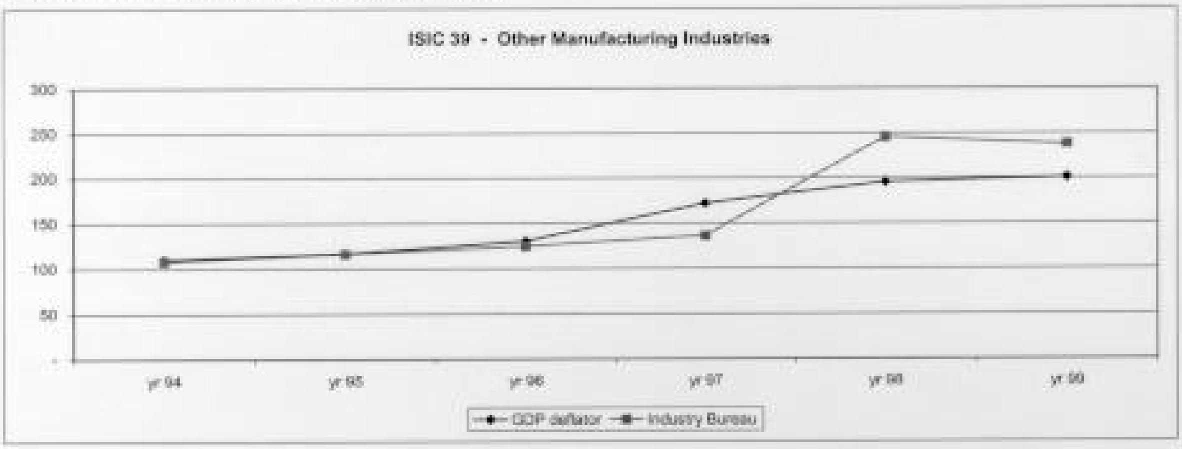
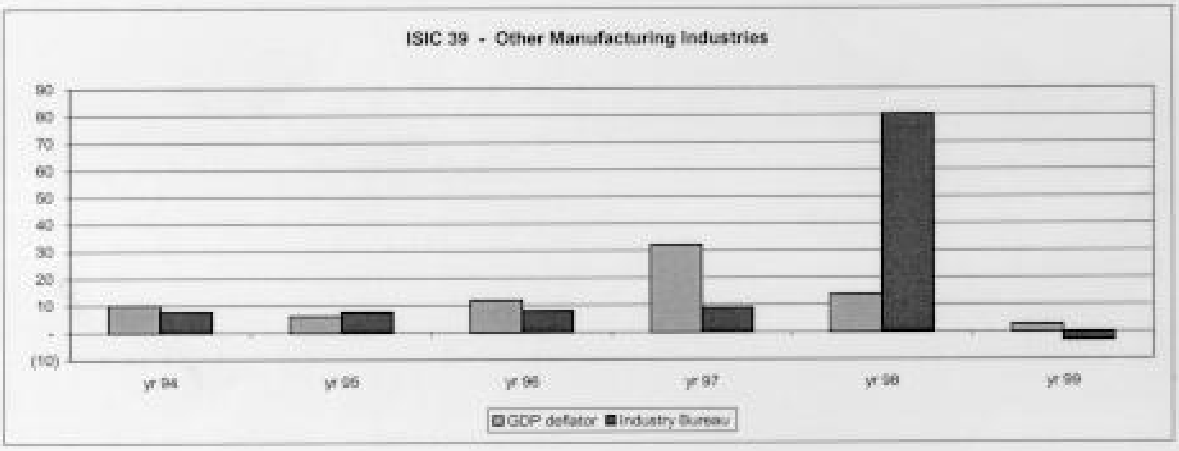


FIGURE A.9

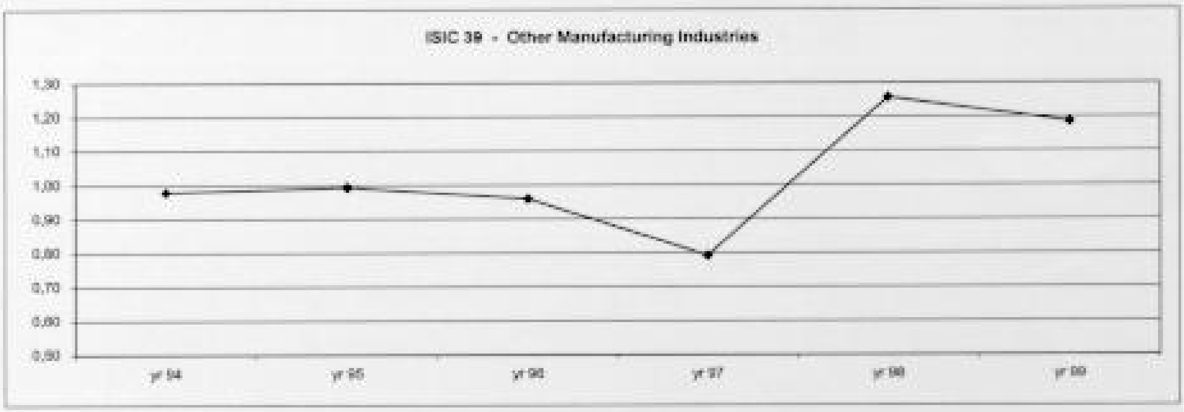
Level of the GDP deflator and the Industry Bureau Price Index:



Rate of Change of the GDP deflator and the Industry Bureau Price Index:



Ratio of the Industry Bureau Price Index to the GDP deflator:



APPENDIX B
QUARTERLY DATA BY 2-DIGIT ISIC

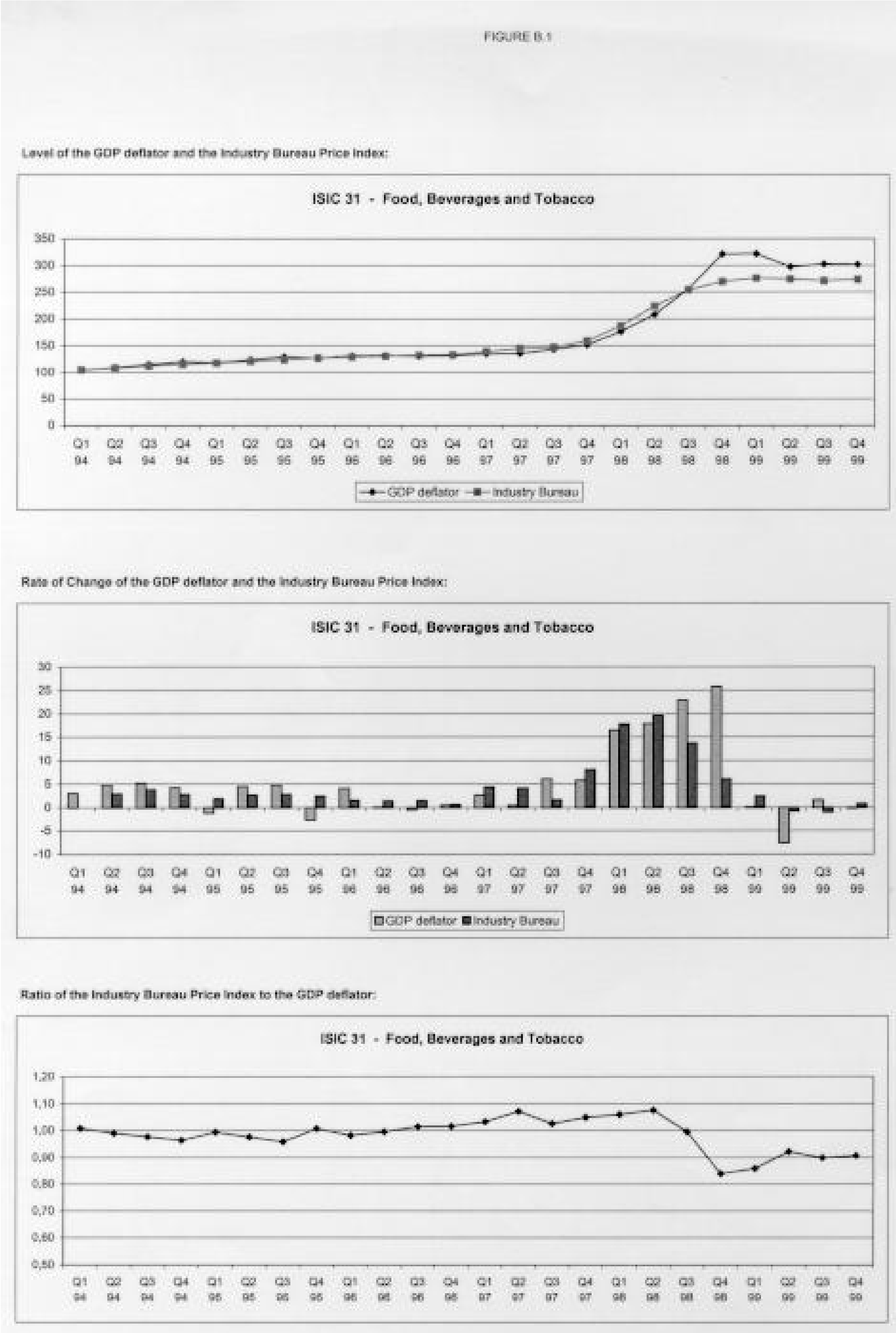
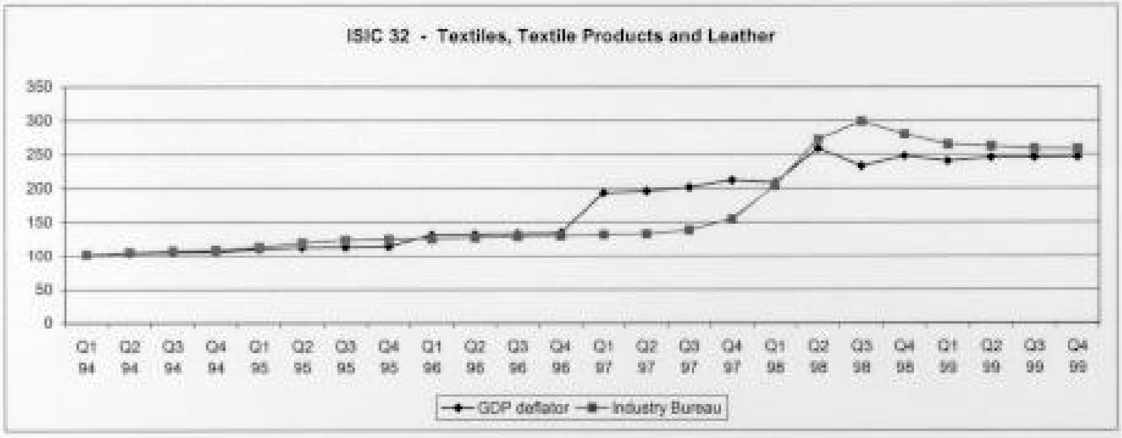


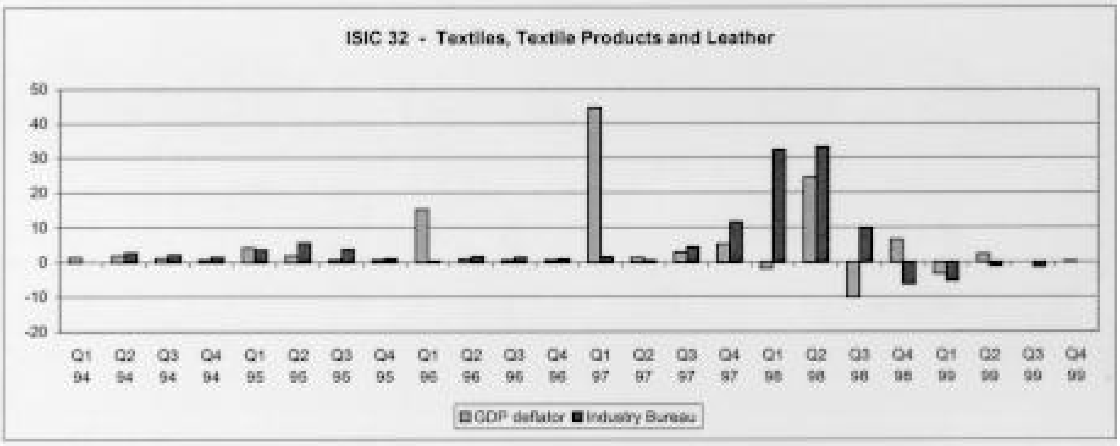
FIGURE B.1
Level of the GDP deflator and the Industry Bureau Price Index:
ISIC 31 - Food, Beverages and Tobacco
GDP deflator
Industry Bureau
Rate of Change of the GDP deflator and the Industry Bureau Price Index:
ISIC 31 - Food, Beverages and Tobacco
GDP deflator
Industry Bureau
Ratio of the Industry Bureau Price Index to the GDP deflator:
ISIC 31 - Food, Beverages and Tobacco

FIGURE B.2

Level of the GDP deflator and the Industry Bureau Price Index:



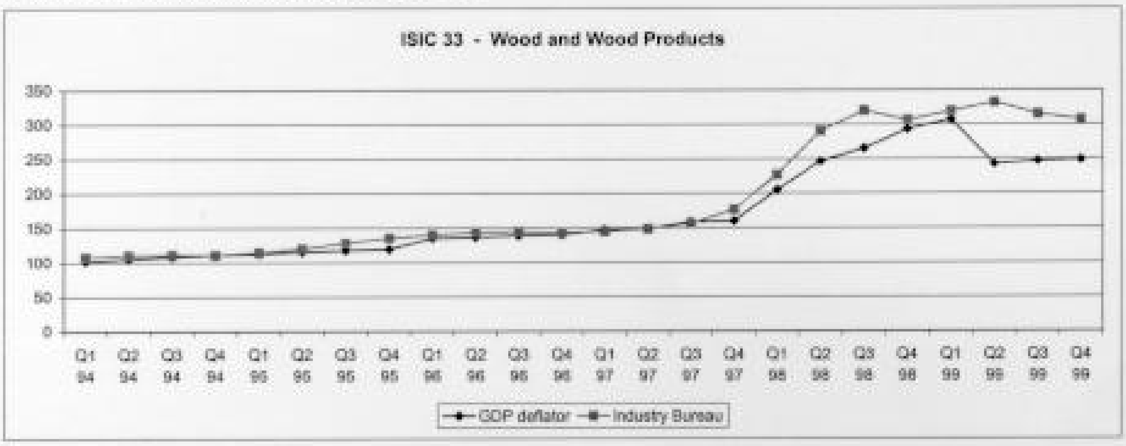
Rate of Change of the GDP deflator and the Industry Bureau Price Index:



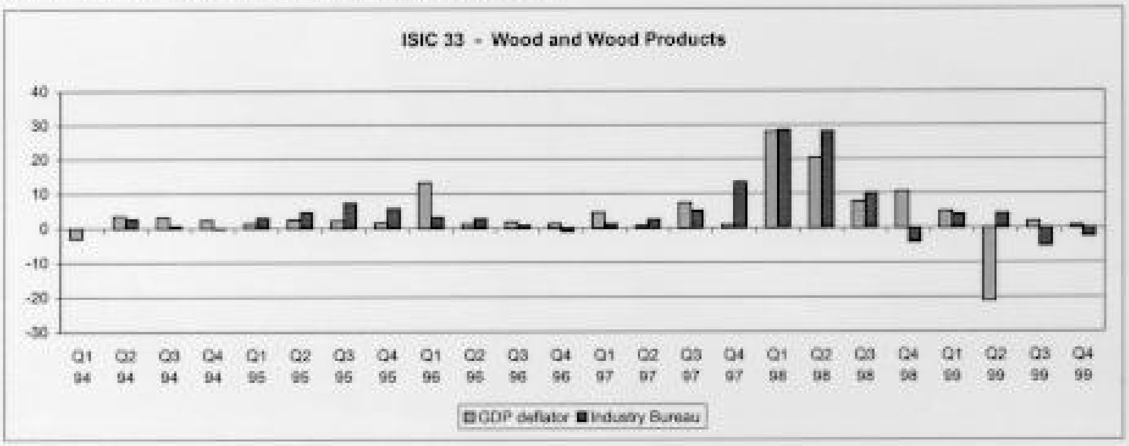
Ratio of the Industry Bureau Price Index to the GDP deflator:

FIGURE 8.3

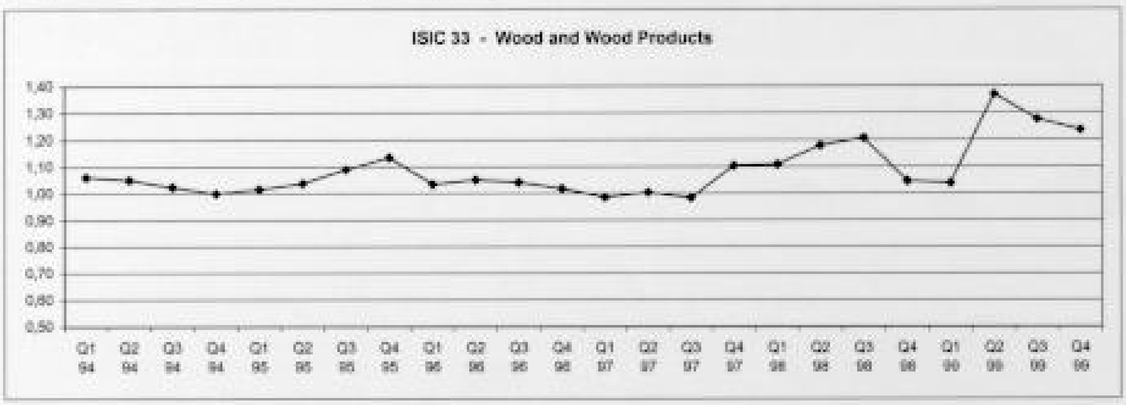
Level of the GDP deflator and the Industry Bureau Price Index:



Rate of Change of the GDP deflator and the Industry Bureau Price Index:



Ratio of the Industry Bureau Price Index to the GDP deflator:



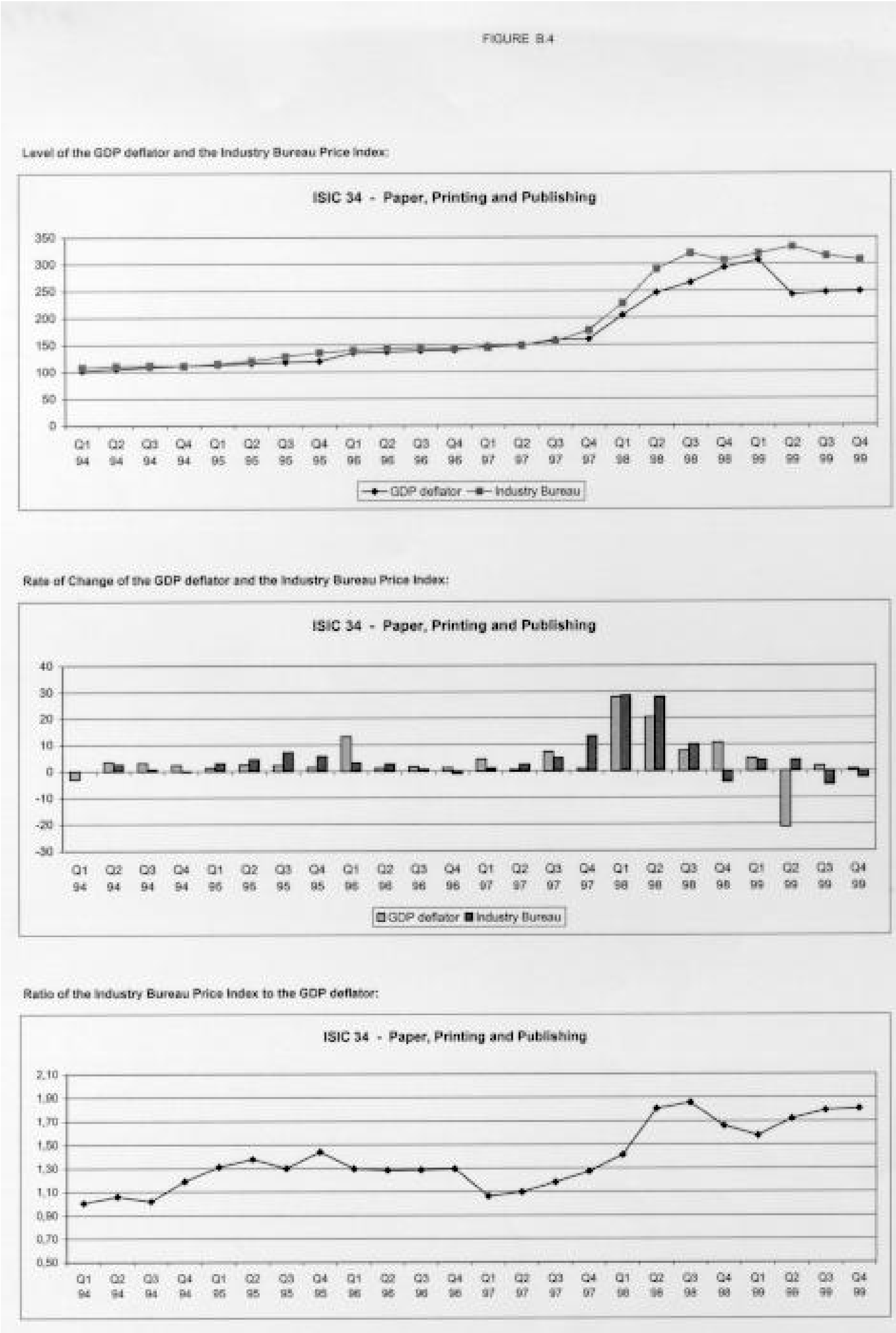
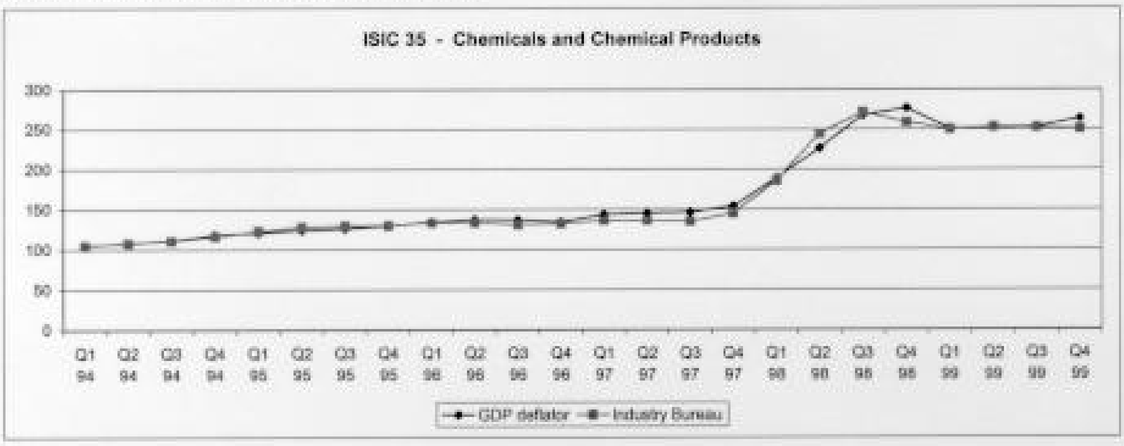


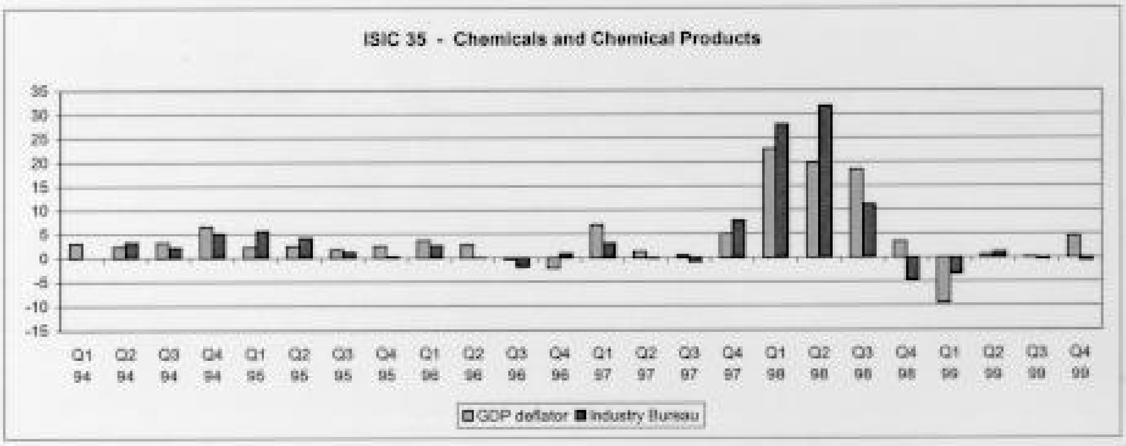
FIGURE B.4
Level of the GDP deflator and the Industry Bureau Price Index:
ISIC 34 - Paper, Printing and Publishing
GDP deflator
Industry Bureau
Rate of Change of the GDP deflator and the Industry Bureau Price Index:
ISIC 34 - Paper, Printing and Publishing
GDP deflator
Industry Bureau
Ratio of the Industry Bureau Price Index to the GDP deflator:
ISIC 34 - Paper, Printing and Publishing

FIGURE B.5

Level of the GDP deflator and the Industry Bureau Price Index:



Rate of Change of the GDP deflator and the Industry Bureau Price Index:



Ratio of the Industry Bureau Price Index to the GDP deflator:

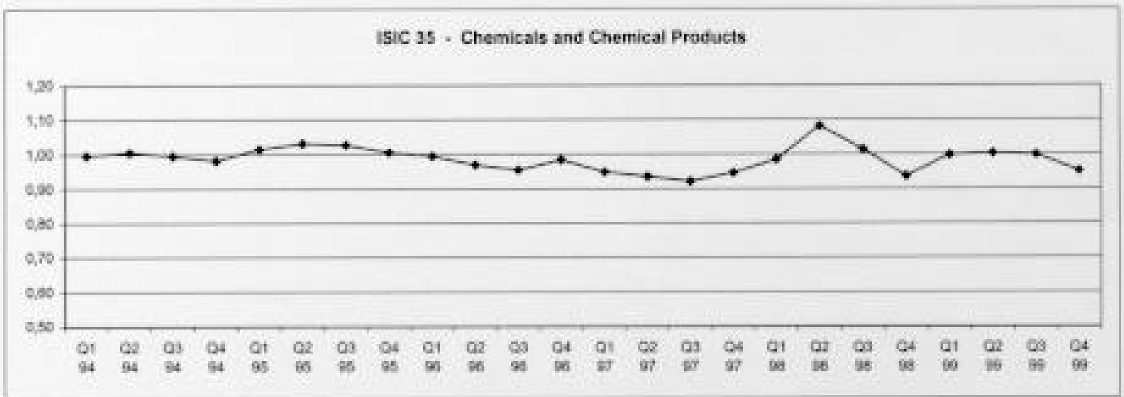


FIGURE B.6

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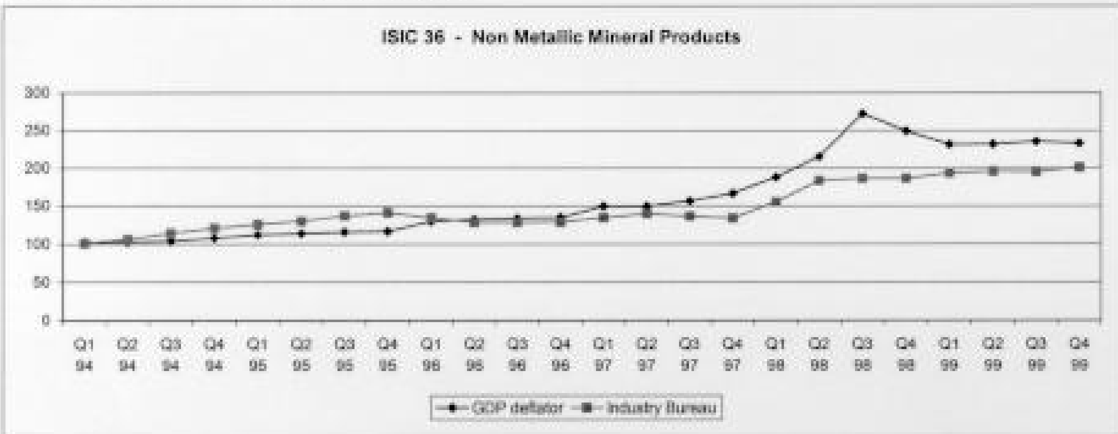
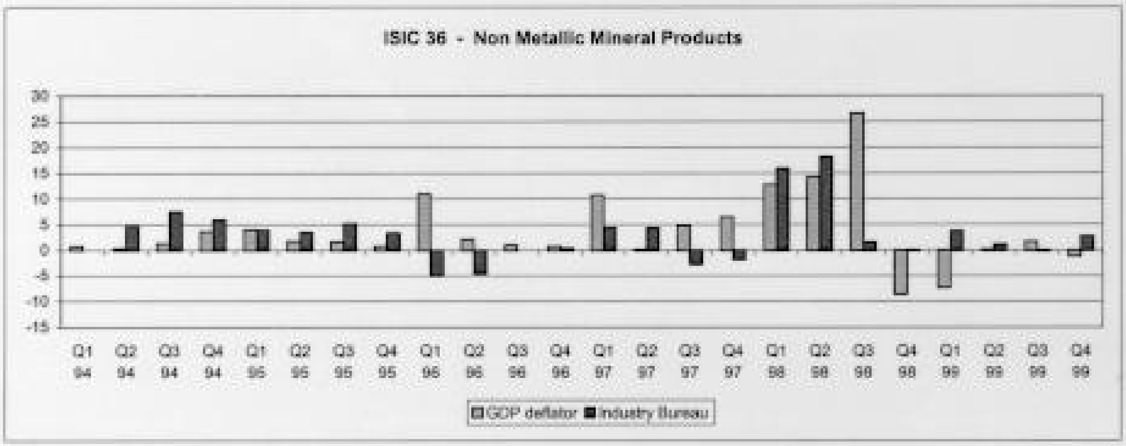


Rate of Change of the GDP deflator and the Industry Bureau Price Index:



Ratio of the Industry Bureau Price Index to the GDP deflator:

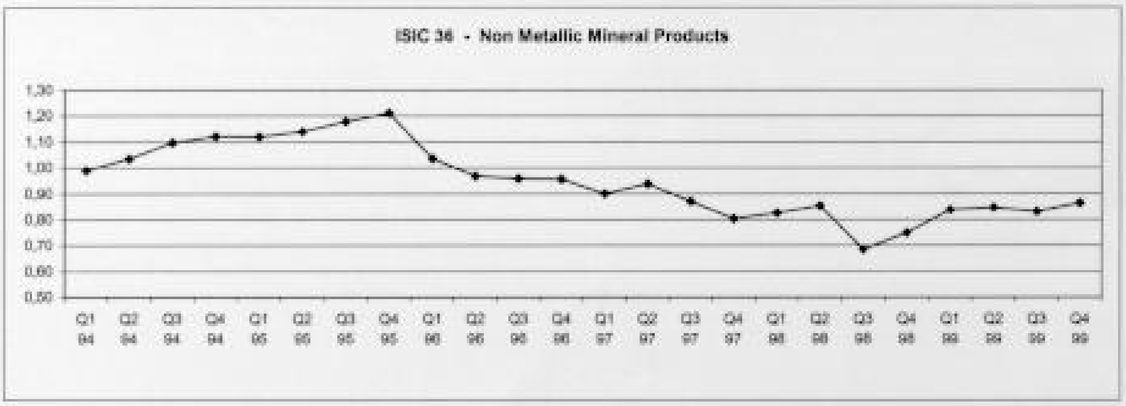
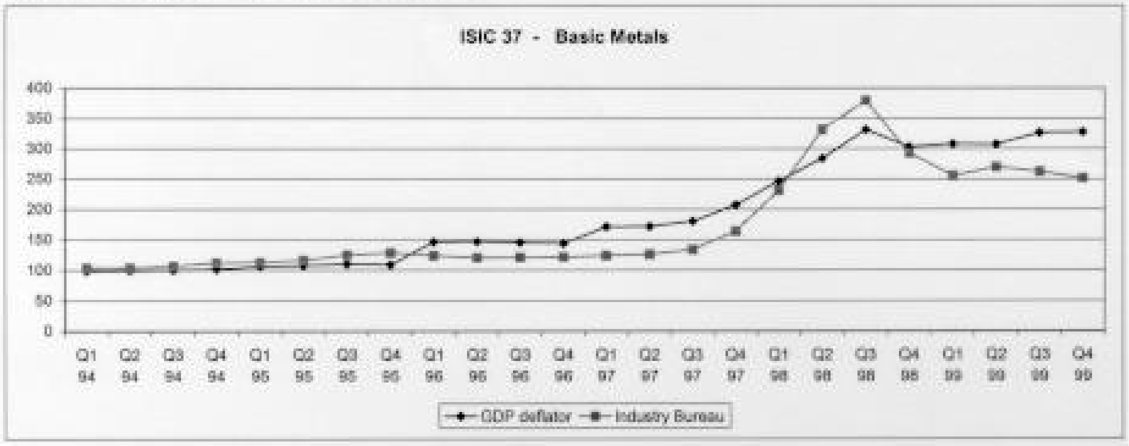
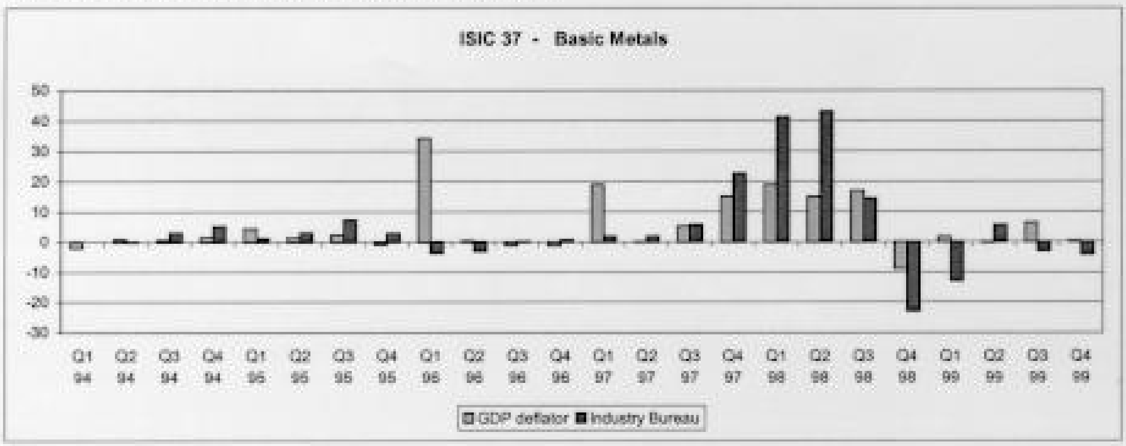


FIGURE 6.7

Level of the GDP deflator and the Industry Bureau Price Index:



Rate of Change of the GDP deflator and the Industry Bureau Price Index:



Ratio of the Industry Bureau Price Index to the GDP deflator:

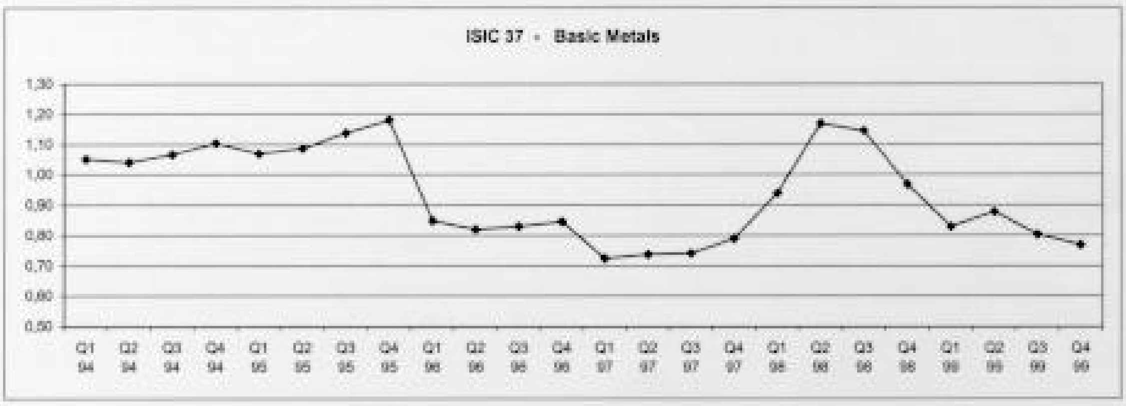
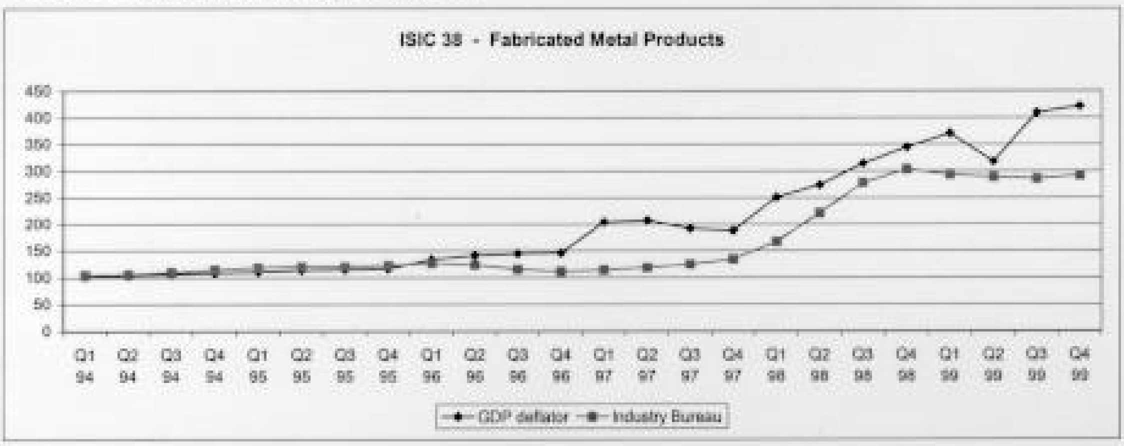
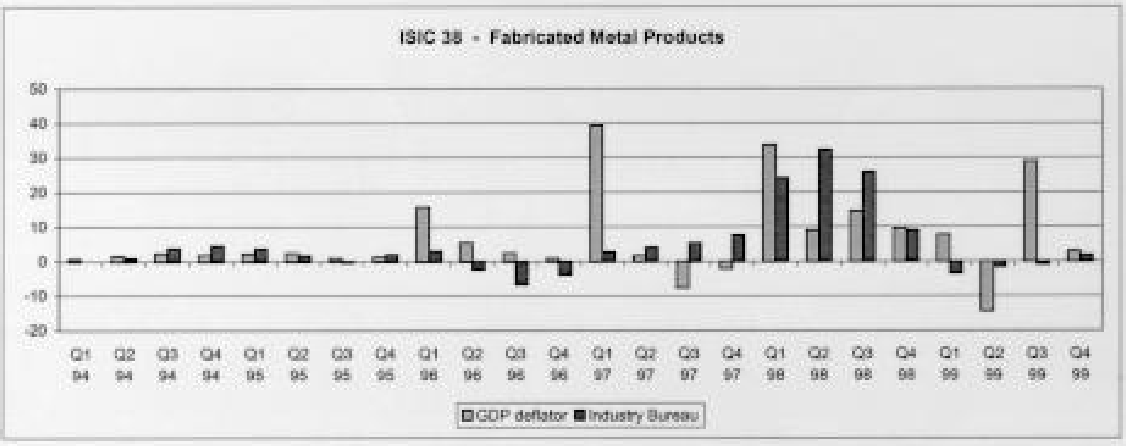


FIGURE 8.8

Level of the GDP deflator and the Industry Bureau Price Index:



Rate of Change of the GDP deflator and the Industry Bureau Price Index:



Ratio of the Industry Bureau Price Index to the GDP deflator:

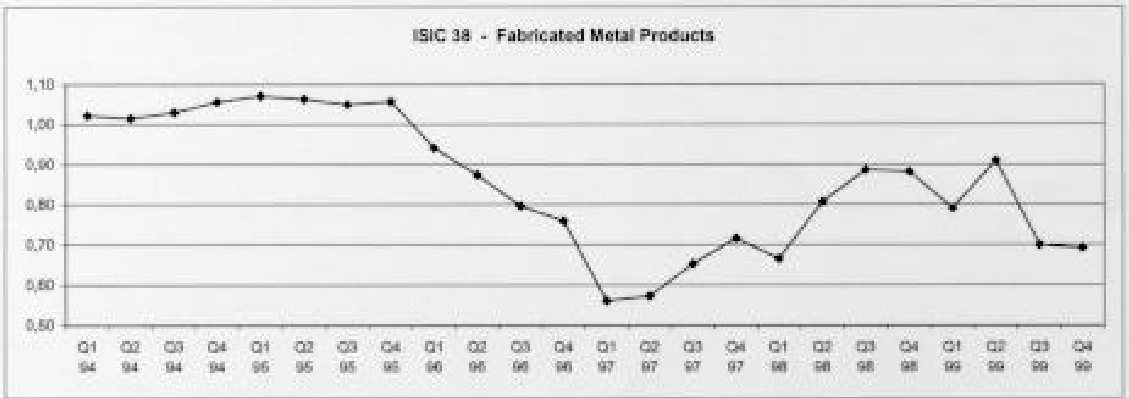
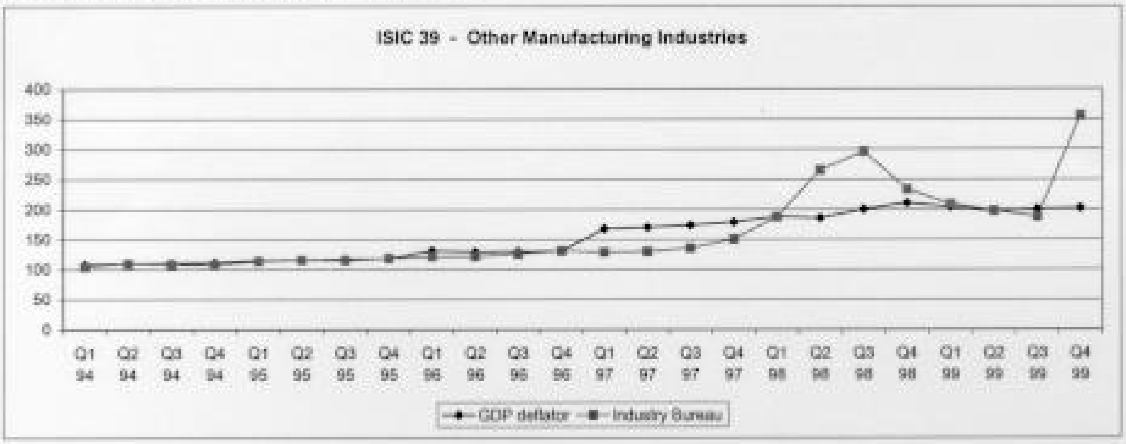
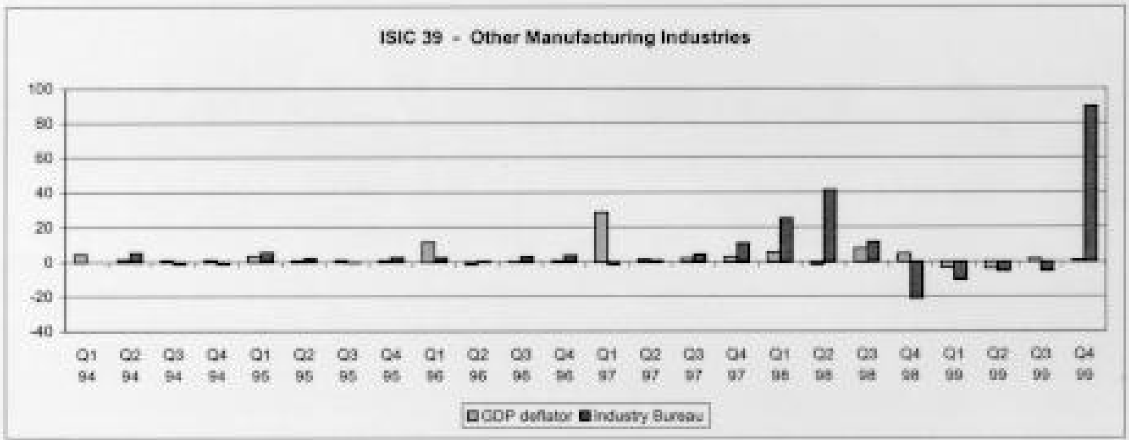


FIGURE B.9

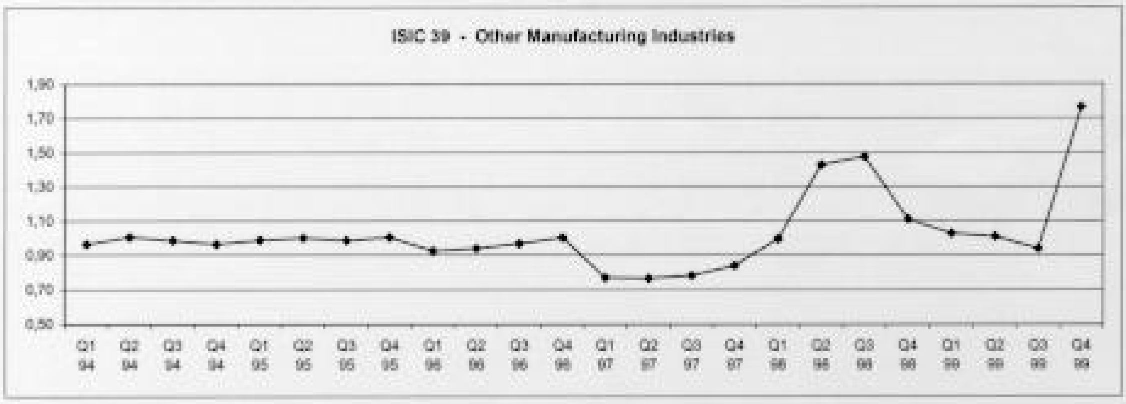
Level of the GDP deflator and the Industry Bureau Price Index:



Rate of Change of the GDP deflator and the Industry Bureau Price Index:



Ratio of the Industry Bureau Price Index to the GDP deflator:



ENHANCING THE ROLE OF FUNCTIONAL STAFF AND IMPROVING PERFORMANCE EVALUATION

Report # 16

by
Sugito Suwito

November, 2000

Statistical Assistance to the Government of Indonesia (STAT) Project
USAID Contract No. PCE-I-00-99-00009-0

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I. INTRODUCTION

The Boston Institute for Developing Economies (BIDE) got a contract from USAID Jakarta to implement its project on Statistical Assistance to the Government of Indonesia under its broader “Support for Economic Growth and Institutional Reform Project (SEGIR)”. To implement the project, BIDE is working closely with the Badan Pusat Sttatistik (BPS), the national statistics office of Indonesia. This project has identified assisting BPS in becoming a customer-oriented organization as a major objective for the next three years. It is in this context that the project is planning, among others, to provide BPS with assistance in institutionalizing data evaluation skills and assistance in establishing regular forums for interaction with users. These developments will precipitate changes which may have organizational implications. Two likely changes are : 1) devising ways to give the functional staffing category more prestige and 2) establishing an adequante performance evaluation system.

This report describes problems and provides recommendations for actions to be taken by BPS in the two areas mentioned above. One should note that basic rules and regulations governing these two items are already available and applicable to all institutions and staff working with the goverment of the Republic of Indonesia. The proposed changes represent just adjustments to be introduced by BPS to improve the effectiveness of existing rules and regulations as they relate to that institution.

The project believes that the creation of a truly effective functional staffing category within BPS would go a long way toward ensuring institutionalization of adequate data evaluation skills as well as the creation of an internal set of checks and balances for producing quality as well as cost effective data. Moreover, BPS is facing the fact that, given the general government-wide move toward efficiency and decentralization, any future growth in the organization can only come from increased productivity, rather than more personnel. Therefore the establishment of a performance evaluation system tied to a performance incentive system and tailored specifically to the needs of BPS has become imperative.

II. FUNCTIONAL STAFFING SYSTEM

A. Background

Civil servants in Indonesia are governed by Laws No. 8/1974 and 43/1999. These Laws stipulate the existence of a structural path and a functional path. Both structural and functional paths provide a career choice to a civil servant through a step-by-step ladder.

Under the structural path, a civil servant can only be promoted if he/she has a good performance and his/her leadership is considered quite good. For functional staff there is no evaluation of leadership skills since they act independently without any subordinates. So basically functional staff are expected to work individually not in a group, and their performance is based on their individual capacity.

The functional path in the civil service is governed by Government Decree No. 16/1994. There are two types of functional posts: one based on skill/expertise and one based on training. The first type requires skills based on the staff's education or methodological/technical capability obtained from experience in their disciplines or based on certification from a recognized institution. The second type usually involves following a pre-specified working procedure rather than research or technical analysis.

There are several categories of functional staff, among others:

1. researchers ("peneliti")
2. statisticians ("statistisi")
3. computer technicians ("pranata komputer")
4. trainers ("widya-iswara")
5. lecturers ("dosen")
6. librarians ("pustakawan")
7. others which are not related to statistical work.

B. Weaknesses of Current System

Although there are many types of functional staff, the most common in BPS are the first six listed above. These do not only apply to the Head Office but also to regional offices. Each category has its own rank and file and its separate procedure for performance evaluation based on some kind of "credit" rating. Ministerial decrees for administrative reform were issued giving instructions to be followed in recording credits achieved for each task performed. Credit accumulated by the functional staff is then calculated, and then a rank is assigned to him/her in accordance with the accumulated credit points. The procedure to submit proposals for obtaining credit points and the procedure to evaluate the performance of functional staff will be discussed in more detail in Section II.C.4 ("Credit System").

How are functional staff assigned their tasks? For the younger generation with a relatively junior rank, a person is usually given a functional assignment if he/she tends to work individually and lacks supervisory and leadership capability. These staff are usually given a specific assignment which cannot be done by someone in a structural position. For more senior officials, assignment of a functional task usually has nothing to do with their leadership capability. In the majority of cases, senior officials get such assignments because of their age: they are not expected to carry a heavy burden, either physically or mentally. Besides, they are expected to step aside and allow younger generation structural employees to take on heavier management and administrative responsibilities to rise up on the career ladder.

This system, while helping to some extent develop particular skills and improve performance of particular units within BPS, suffers from three major inter-related weaknesses:

1. Sole Reliance on Technical "Credits"

The current functional system seems to have served younger staff quite well. It can accommodate their individual ability without burdening them with supervisory responsibilities, thus allowing them to further their own interest rather than to ensure success of a whole administrative unit. For senior staff, however, the system has not worked as well. Most of the time, the staff have a high excess capacity, mainly due to their outstanding ability, knowledge, expertise and experience which cannot be appropriately measured by the current credit point system.

In theory, the credit system is directly related to the quality of the work performed. In other words, the credit obtained by a particular employee reflects the work performed and successfully completed by that employee. In practice, however, it is not quite easy to maximize the performance of individual functional staff because their expertise might not be suitably assigned to only one type of work. For instance, a "lecturer" is expected to spend most of his/her time teaching at STIS, the graduate statistics program run by BPS. But if he/she also possesses outstanding skills in survey design, for instance, then the credit that will be given to him as a "lecturer" will not reflect his full potential since it will be limited to his teaching skills. Similarly, someone assigned as a "trainer" may have the same problem.

2. Underutilization of Skills

By assigning senior staff with only one functional category for the purpose of credit accumulation, the system does not always take into consideration the considerable experience they have acquired: most have over 25 years of valuable experience in various capacities within BPS. The situation is relatively serious with high-ranking functional staff. That is why this report will emphasize improvement of higher-ranking functional staff, usually comparable to echelon I or II in the structural path.

The credit point system measures a person's achievement in a single pre-specified area. Such rigidity is meant to identify highly specialized functions in as much detail as possible. From that point of view, the credit system is quite good, because it allows concrete measurement of achievement according to well-defined goals. However from the staff point of view, the system does not take into account their full range of capabilities. Since most of the senior staff usually rise to high-level positions because of their experience in a number of subject matter areas, the system assigns too narrow a scope and ignores other substantial skills that they possess. The result is that they a substantial under-utilization of useful available skills.

3. Lack of Institutional Authority

Another important issue one needs to consider is the official relationship between structural and functional staff. Structural staff are the officials responsible for the success of the work assigned to their units. In principle, all BPS responsibility should be distributed to all available units within the existing structure. Attached to all these officials are also the authority and power necessary to exercise their duty and responsibility. To shoulder their responsibility, they need the necessary technical skills, administrative knowledge as well as managerial capability.

Functional staff, on the other hand, do not have any authority or power within a particular working unit. Rather, they are expected to contribute their expertise across a wide range of units in accordance with their skills, expertise and experience. They are not responsible for the success of a particular subject matter division but rather for backing it up in technical areas in which they are proficient. As such, they do not have a "boss" or a "subordinate". They just work independently to accumulate as many credit points as possible to maintain or improve their functional rank.

Let us take a specific example which illustrates the weaknesses elaborated above. Because of his seniority, a former Bureau Chief whose interest was only in a particular field had reached a dead end in the structural career ladder. He could not be promoted to Deputy because of his interests, experience and working history. Instead, he took the functional position of "Widya-Iswara" (trainer), which would allow him to retire at the age of 65 (compared to 60 for structural positions) and to work solely in his technical field of interest. However, his talent and expertise were ignored by the structural subject matter divisions until two things happened to change the situation. First a big Census undertaking took place, and secondly, the Head of BPS insisted on his involvement as a technical coordinator. That ensured that his expertise was used to the fullest. But it did not happen automatically: it required an event such as a Census as well as direct intervention from the Head of BPS. Ideally, one would like to have an institutional mechanism that would ensure that.

C. Recommended Improvements

The above weaknesses need to be overcome so that BPS can take full advantage of the skills and expertise of the increasing number of functional staff, particularly at a time of budget restraint. At the same time, ways must be devised to provide the right incentive for these staff to be fully engaged in activities related to their areas of expertise and to be adequately rewarded for their engagement. One should also point out that these weaknesses are not limited to BPS, but rather apply to all other government agencies. Since it is not easy to alter or revise the regulation governing functional staff, given that it would imply revision of the Law, government decrees and ministerial decrees, this report will limit its contribution to providing ideas on how to benefit from the existing senior functional staff without deviating too much from the existing laws and regulations.

1. General Policy Instruments

Basically functional staff have a high level of skill, education and experience. In general they usually have more time for reading, paper writing, discussion, presentation, participation in seminars and other similar activities. Since they usually rely on their personal capacity rather than a group in a certain working unit, they should be more productive and they can accomplish their assignment faster. This is the main difference between them and those following the structural path, because the latter always rely on group support.

So the second recommendation is that BPS should regard them as experts in their respective fields, and their working system should not be far from the work of expatriates as experts provided by donor agencies. This is something which should be fully considered and the management and all staff aware of.

If this could be enforced then every time BPS has a technical assistance project from donor agencies, the main counterparts of the foreign experts should be the related structural working units. If there is no foreign technical assistance, research and development should also be assigned to the functional staff in cooperation with Biro Lisbang (Analysis and Development). This is assuming that the functional staff are experts in their respective field.

To meet the above mentioned condition, the BPS staff who want to join functional path should fulfil a certain standard of requirement. There should be no image that those who in one way or another are not eligible to follow the structural path will easily be assigned as a functional staff without considering their expertise and working experience. To increase the quality of functional staff, the acceptance procedure should be made more rigid, and the allocation of credits should follow the rules more strictly.

2. Greater Role in Consistency Checks

In order for functional staff to contribute to evaluation and improvement of the quality of data produced by subject matter divisions, one has to carefully design a system of participation of these staff which does not delay output of structural staff. Otherwise, structural staff will be reluctant to wait for the functional staff to complete their exercise. This is quite crucial in building the necessary cooperation between the functional and structural staff.

The contribution of the functional staff to the work of structural staff or the overall performance of the BPS could be best achieved by allowing them to evaluate various data already produced. In other words, by having them perform some sort of post edit. This activity could be accomplished by producing internal consistency checks. This activity will not delay publication, but it will provide feedback to structural staff regarding the quality and accuracy of the data. Since consistency checks usually cut across many areas, structural staff (at the division or bureau chief levels) usually do not have the authority to enforce them. The authority lies with Deputies or even the Head or Vice Head of BPS. But given the limited time available to these people, it is not realistic to expect them to conduct these checks. That is why consistency checks should be and are best done by functional staff with sufficient experience in a certain subject matter.

3. Institutional Authority

As mentioned earlier, functional staff do not have managerial authority within a particular working unit. Their comments and recommendations will not be automatically taken into the system by the structural staff. The decision rests with structural officials based on their discussions and deliberations within the structural working units.

Since they don't have the authority to enforce their recommendations, functional staff rely on their professional competence to convince structural staff to accept their ideas. In other words, the authority should not come from the organizational line in the form of managerial power but coming rather from their own ability to convince others to follow their ideas. Such ideas would have come from their expertise, knowledge and experiences.

In most cases an ideal and good recommendation does not necessarily mean that the recommendation will be automatically implemented fully by the structural staff. Aside from the sophistication of the recommendation, there is still a very important factor which should be fully taken into consideration by the functional staff when they prepare their final recommendation. In some cases this particular factor is rather subjective, even though it will influence the decision whether the recommendation should be implemented. For this purpose the functional have the ability to convince the structural staff, of the importance, effectiveness as well as the feasibility of the ideas. So in this case acceptance by the structural staff is very important.

A mechanism should therefore be developed to increase the degree of acceptance of the structural staff when the functional staff's idea is presented to them. One possible mechanism is for the functional staff to prepare an annual Plan of Work. Their Plan of Work should be discussed not only with the Coordinator in charge but also with the related subject matter divisions who will have to be convinced during the final stage of the work of the functional staff, because these subject matter divisions will be the implementing working units. This approach will increase the degree of acceptability of the work of the functional staff. The more detailed the Plan of Work will be the easier for the structural staff to evaluate and eventually accept it.

In other words, the technical authority of the functional staff will be higher and more effective if the functional staff have the necessary knowledge, expertise and experience and also the ability to convince relevant users through a series of discussions and put the result of deliberations into a detailed Plan of Work. The plan of work of each functional staff would have a higher acceptability because the contents would have been discussed with the relevant working units. By so doing the functional staff will gain the respect of the related subject matter divisions.

Another way to increase technical authority of the functional staff is to create a Technical

Team of functional staff working to solve, develop or increase the quality of data in a particular area. This Technical Team will pool all ideas together and will be in a better position to support subject matter divisions. Having a Technical Team would also help to minimize the possibility of personality conflict between a particular individual and the structural staff. Another advantage would be that such a team may pool the expertise of several functional staff groups (e.g. a team Widyaiswara, Dosen, Peneliti, etc.) to tackle a particular problem.

Let's take, for example, the preparation of the population census as a task. A Technical Team may consist of functional staff with expertise covering sampling techniques, demography, field operations, information technology (data processing), regardless of what functional group they belong to. Since the functional staff has the expertise and experience, has more time to think, contemplate and come up with better ideas to be discussed with structural staff. Such an arrangement would be more acceptable to all parties concerned since implementation of big tasks requires the skills and support of a well diversified expert group.

4. Credit System

For each functional post, there is always a circular issued jointly by the Head of the Personnel Commission (Badan Kepegawaian Negara, BKN) and the Head of the Public Administration Institute (Lembaga Administrasi Negara, LAN). Both BKN and LAN are under the coordination of the Minister for Administrative Reform. The joint circular officially describes the definitions, rules and regulations governing the overall technical guidelines concerning performance evaluation, assignment of credit points, procedures to join the functional path, the promotion system and the temporary disengagement of the functional staff. It also describes the ranking system in each one of the functional paths, and the specific areas of their activity, so that the domain of their responsibilities in which they will receive a certain credit point is made very clear. The assignment of credit points depends on the type of activity, which is broken down into main activities and auxilliary activities. Credit points assigned to the accomplishment of main activities are much higher than those assigned to auxiliary activities.

Every functional staff should maintain every year a minimum number of credit points. Besides that, if they want to get a promotion to a higher rank a certain number of credit points achieved should come from the main activities. For instance, for a Widyaiswara 70 percent of the credit points should come from the main activities. The main activities/requirements of the Widyaiswara is to pass a certain degree of formal education; to give and write papers related to the subject of their lectures, training & education; and to conduct joint research in a training and education center (DIKLAT).

The functional staff should submit a Proposal for Credit Evaluation (Daftar Usulan Penilaian Angka Kredit, DUPAK) to the Evaluation Team. This DUPAK describes the staff's achievement in the previous period and contains detailed attachments of the various activities completed and the reports/papers submitted.

For middle and lower level functional staff, the Evaluation Team usually consists of the higher official in the respective institution. For higher level functional staff the Evaluation Team comes from the institution in charge of the management and development of the subject concerned. For instance for Widyaiswara (staff training & up-grading) the Evaluation Team is the Lembaga Administrasi Negara (LAN), for Peneliti (Researcher) the Evaluation Team is LIPI (Indonesian Institute of Science), for statistisi the Evaluation Team is BPS, etc.

For higher level functional staff, the submission of a Proposal for Credit Evaluation to the Evaluation Team should be endorsed by the Director General of BPS. This is because the assignment of the higher functional staff should come from the Director General through the Bureau Chief in-charge, for instance Widyaiswara through the Chief of the Statistics & Computer Training Center, for the Computer Functional Staff (Pranata Komputer) through the Chief Bureau of Statistical Information System, etc.

When the Proposal for Credit Evaluation is approved by the Evaluation Team, the functional staff will get additional credit points. If the total accumulated credit points reach the minimum needed for a higher rank, the functional staff will be granted that rank. Functional staff with higher rank receive higher renumeration from the government.

The recommendation to be made with regard to this credit system is that the system should be made more flexible. The work and output of the functional staff should not be limited to work undertaken under their own functional group. There must be flexibility with regards to the application of their expertise across different functional groups. A sampling expert should be given flexibility to contribute his/her expertise to other functional groups, even though teaching is supposed to be his/her major activity since he/she belongs to the functional dosen group. Similarly with the other expertise.

If this flexibility could be achieved, all the expertise and experiences of the functional staff could be fully utilized. The contribution of the functional staff will be maximized since they have the flexibility to render their outputs and suggestions regardless of their grouping.

5. Direction From the Top

Another factor that very much depends on the initiative of the Head is the follow-up actions to be taken by the structural staff. In many cases the recommendations of the functional staff will be meaningful only if the structural staff take action and discuss implementation with the functional staff. The attention of the Head and or the Deputies to take follow-up actions will indicate how useful the input of functional staff is, even though for the functional staff themselves, the implementation stage will no longer add to their credit points.

A good system is necessary but not sufficient for the success of improving the performance of functional staff. Strong leadership is required, since traditionally the staff tend to be deferential. Without strong goodwill there will be not enough participation from the staff at the operational level.

Actually a strong push from above is just to show to all the staff, both structural and functional alike, that the recommendations put foward are in agreement with the policy of top management, so that all the staff should give their share of input for the success of the program. Achievement and progress could be successfully realized only if there is a good system with the necessary human resources to implement the program and with all working together to reach the target.

III. PERFORMANCE EVALUATION

A. Background

Two laws govern civil servants: Law No. 18/1974 and Law No. 43/1999. Both laws describe in detail the rights and responsibilities of all civil servants, career planning, management, code of conduct, etc. To implement these laws, government decrees were issued. Decree No. 10/1979 was issued to describe the system of performance evaluation, describing in great detail guidelines for the supervisors (evaluators) in evaluating their subordinates (evaluated). Each one of the criteria for evaluation is elaborated, any action and/or accomplishment of the subordinate during the last year is described in descending order of importance.

Theoretically, it is quite clear to every supervisor what grade to assign, since the guidelines are highly detailed and specific. In practice, however, it is quite difficult to follow the guidelines due to the subjectivity factor of the supervisor. This is because behavior or accomplishment sometimes are not easy to quantify. Another handicap for government agencies like BPS is that there is no flexibility to deviate from this decree, because according to the legal hierarchy, a government decree (Peraturan Pemerintah) is higher than a Presidential Decree, so not even a Minister can deviate from it.

The discussion and recommendation in this report will describe only some possible suggestions to modify the application of that system, rather than to overhaul it.

B. Current System

The performance evaluation system for civil servants is implemented every year through the adoption of DP3 (Daftar Penilaian Pelaksanaan Pekerjaan). The system aims at human resource development, increasing their ability and improving their attitude toward a conducive environment for the accomplishment of their responsibility and the achievement of the target and mission of the agency. This DP3 is very important for both management and staff to use as an objective instrument for the career planning of the staff. It is also useful for monitoring progress of the institution in human resource development and in identifying training needs and areas for skill upgrading.

It is true that most of the criteria are difficult to measure. However if the supervisors can follow the guidelines properly, they can reduce their subjective evaluation. In fact the guidelines give detailed descriptions of the grades to be assigned in each one of the criteria. To overcome the subjective evaluation of the direct supervisor, the system stipulates that the supervisor of the evaluator, e.g. the bureau chief as the supervisor of the division chief in evaluating the sub-division chief, should give his consent in the grade allocated, or the subordinate has the right to express their objection. Since DP3 is very general in nature and applicable to all government employees regardless of their specific type of work, there are always strengths and weaknesses involved.

The strengths among others are that the system has clear criteria for evaluation, and it uses standardized measurement units which can be added and averaged with aggreated results always consistent with underlying ones. On the other hand, the weaknesses are that the system gives the same weight to the 8 criteria used, and it may count the effect of the same variable more than once.

Even though the strengths and weaknesses could easily be analyzed, BPS, like any other government agencies, does not have the flexibility to deviate from the general rule or to give incentives to the staff at will.

An ideal perfomance evaluation system should follow these general principles:

a. Performance criteria must be clearly defined and easily understood by both concerned.

b. Performance criteria should be fair to the evaluated and evaluator.

c. The effect of a particular criterion should be measured once and only once.

d. An incentive system has to be instituted which links rewards with performance.

With a private company this general principle could be easily imposed, but with government agencies there must uniformity in rules and regulations since there is only one system for promotion, evaluation and incentive.

If a modified system ca be envisaged for BPS, the flexibility should apply at the stage of implementation, not in devising a new set of rules and regulations.

C. Recommendations

The following suggestions are provided to make the current system more effective:

1. The system should satisfy all the principles of performance evaluation stated in the previous section.

2. The guidelines for DP3 as described under Government Decree No. 10/1979 are quite clear and detailed. However the application should be very cautious and far from subjectivity. One example is provided in Appendix A.

3. To the extent possible, the grading of a certain criterion should be quantified, which is possible in most of technical tasks. An example is provided in Appendix B.

4. Performance evaluation should be incorporated into the career planning system. There must be a high correlation between the two systems to encourage all the staff to adhere to the system. In this way the promotion scheme will be relatively more objective and all the staff will be fairly treated and the working spirit will be increasing. There will be a healthy and fair competition among the staff.

5. The application of performance evaluation should be preceded by a job evaluation and a job description. Only when a job description is already available for each one of the staff in charge, can the 8 criteria for evaluation be linked with their activities. In this way some of the criteria will be measurable and could be given a grade accordingly. A discussion of this subject is provided in Appendix C.

APPENDIX A
REDUCING SUBJECTIVITY

One important principle of performance evaluation is that it must be objective, fair and comparable across-the-board. Most of the criteria for evaluation are relatively subjective in nature. They are not quantifiable and difficult to apply consistently across the board.

To evaluate the performance of one individual staff, different supervisors will come to different grade because of the different background and working experience of the respective supervisor. This is actually very natural and universal. The issue of performance evaluation is not only a serious problem in developing countries, but in developed countries as well. The aim here is not how to make the system absolutely objective, something which is almost impossible, but how to reduce the deviation from the objective principle.

One way to achieve that is by setting up a collective evaluation of the subordinates. For example, to evaluate the performance of a sub-division chief, it should not be solely done by the division chief as his supervisor, but by all division chiefs in the same bureau. Similarly the DP3 of the division chiefs should be evaluated collectively by all bureau chiefs under one deputy, and the bureau chiefs should be evaluated by all deputies as a group. At least this collective approach will reduce any possible individual bias and produce a more objective evaluation. Based on this approach, even though evaluation is done collectively, the direct supervisor should have more say (i.e. a higher weight) since he is directly in charge of the person being evaluated.

Another advantage of the collective system is that the evaluation by the supervisors will be comparable across-the board. The possibility of like and dislike will be reduced to a minimum because in a collective evaluation the extreme evaluator will tend to be outnumbered by the others in the group. The idea is that the system should be fair to all the staff and the institution as a whole, not just to the direct supervisor.

Another advantage is that the subordinates will tend to accept the evaluation. Since the evaluation is done collectively, the objection from the subordinates will be less than the ordinary approach. If some of the subordinates do express their objection, the supervisors will support each other to reduce the strain and increase better communication between the supervisor and the subordinate. In this way their working spirit will be made conducive for the progress of the agency. This assumes that all supervisors are wise men, so that there will be no negotiation to sacrifice the staff, since the success of the institution rather than their personal interest is their final goal.

This collective evaluation, at least for the BPS culture will decrease subjectivity, increase objectivity and acceptability.

APPENDIX B
QUANTIFYING INDICATORS

Most of the criteria for evaluation are difficult to measure and sometimes almost impossible to quantify. However the guidelines actually provide a step-by-step and clear-cut procedure. The problem here is that the judgment by the supervisor might not be unique. In other words the application of the guidelines in real life may not be as desired in theory.

Let's take an example. The grading system on DP3 is as follows:

- grade 91 - 100: Very Good
- grade 76 - 90: Good
- grade 61 - 75: Satisfactory
- grade 51 - 60: Average
- grade ≤ 50: Poor

Guidelines under Government Decree No. 10/1979 state that each criterion has a detailed description of the achievements, efforts, behavior or attitude of the evaluated and the corresponding grades. For instance under the criterion of "responsibility" the guidelines state the following:

a. if the subordinate ALWAYS completes his duty well and on time, the grade is 91-100 and he is considered as very good.

b. if in GENERAL the subordinate could complete the duty well and on time, the grade is in the range 76-90 and he is considered as a good staff.

c. if SOMETIMES he is late in completing the duty or on time but incomplete, the grade is in the range 61-75 and his achievement is just satisfactory.

d. if SOMETIMES he cannot not finish his job well and delays completion considerably, the grade is in the range 51-60 and his achievement is just average.

e. if he HAS problems and cannot finish his job most of the time then his grade is 50 or less and his performance is considered poor.

So at least there are some indications. The head of a certain working unit is actually not supposed to work for himself but rather to lead the unit to achieve the target. That is why the 8th criteria, i.e. the leadership, only applies to heads of working units. In this case, the evaluation should be carefully linked to the scope and coverage of his responsibility. That is why his responsibility is only limited to what is under his control in his working unit. Let's take as an example the Quarterly Industry Sub-division Chief. One cannot simply assign a grade based on the timeliness of publication. There is one important factor which is outside of his control but which very much affects the timeliness: that is the input data from the field. For the Bureau Chief or the Deputy, the input data is part of their responsibility because they have the authority to ask the regional offices to follow the set time schedules, but not the Sub-division Chief. This may appear simple but is actually very crucial for the evaluator. Again even here the importance of collective evaluation is one possible solution.

An important issue is a problem of quantification. For the head of a working unit, the solution is easier since the evaluation covers the achievement of the unit as a whole not only his technical ability. For instance, the Chief of the BPS Provincial Office should be responsible for field operations, local publication, smooth communication with local government and local users, public relations, etc., most of which can be quantified. For instance, field operations could be measured by the returns from the field. Publication can also be measured by the by adherence to pre-set time schedules. Relations with local governments could be measured by the number of surveys or analyses submitted and requested by local governments, or by the amount of money provided by the local government to the provincial BPS office. These are just examples of how one can go about quantifying achievements. However for the difficult criteria to link to a certain measurable achievement, it will be more difficult to make evaluation objective, and again collective evaluation will provide an answer to part of the problem.

APPENDIX C
JOB DESCRIPTIONS

In most cases the evaluation by a supervisor is quite difficult because there is no basis to assign the grade. The boundary of the work and supplementary activities of an individual subordinate is usually not very clear, so that the evaluation will be very much subjective. And the chief of the working unit has the authority to assign to every individual staff an additional job as the need arises if there is a shortage of staff. This is especially true if the number of staff in a working unit is too high or too low. But if the number of staff is really ideal, that is consistent with the workload, the responsibility of each individual will be quite clear. There will be no excess of workload or excess capacity of existing staff, so that all the staff will be fully utilized and the evaluation of their performance will be clearly and easily conducted.

To come up to this ideal condition, every working unit should be placed properly in the structure of the organization. The responsibility, scope of work and the contribution of each unit to the agency's goal should be clearly defined. Then, in order for it to achieve its goal, it has to clearly estimate the required staff and resources (including financial) for every working unit. For this purpose job analysis is important: it has to be applied to every working unit, so that based on the scope of work and responsibility, the respective working unit will be able to estimate its required staff and their qualifications. Similarly with required equipment and their configuration.

Unfortunately, a good job analysis is a lengthly and costly undertaking, and may also disturb the working units. BPS has initiated such an undertaking about 7-8 years ago but had to terminate it because of a number of reasons. If the undertaking could be continued with the external assistance, the result of this undertaking will be very important as an input for developing job descriptions for each one of the working unit and followed by the job description of the individual staff as member of the working unit.

If the job description for each staff is available then his/her scope of work could be clearly defined and the performance evaluation will have strong and solid basis. This is of course an ideal condition and requires political will from the top, sufficient financial support as well as the necessary budget to maintain the system. Why is maintenance required? With the rapid development, especially in information technology, many types of work are very much affected and consequently affect the job description. From year to year the job description should be amended following the development in the instrument for performing work, since technological development is also growing very fast.

If all these requirements could be met, the performance evaluation will be conducted properly and the staff will be treated fairly, and the progress of work will be faster.

THE CONSUMER PRICE INDEX : SELECTED CONCEPTUAL ISSUES

Report # 26

by
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I. INTRODUCTION

The Consumer Price Index (CPI) is one of the most watched and scrutinized short term indicators produced by BPS. In its continuing efforts to improve statistics provided to users, BPS is currently assessing the feasibility of incorporating new commodities and new outlets into its existing CPI. These fall under three broad conceptual issues: new product bias, quality changes and new outlet bias.

This report covers a number of general conceptional issues encountered in calculating the CPI. Coverage issues are discussed in Section II and computational issues in Section III. Then a discussion of the above potential biases is provided in Section IV. Finally Section V provides some concluding remarks.

II. COVERAGE

A. Geographic Areas

Geographic coverage of the consumer price index in Indonesia is restricted to urban households, as is the practice in all other countries. The CPI computed at the national level is aggregated from indexes for 43 cities across Indonesia. Thus the CPI as published is not meant to, and may not necessarily, reflect price changes faced by households in rural areas.

Observations in this report will, therefore, be limited to those relevant to calculating the CPI in urban areas. It may be possible to compute a rural index with weights obtained from information on consumer expenditures of rural households by using expenditure data from the Susenas survey, but expanded for this particular purpose as to the categories of expenditures covered. BPS is currently evaluating this approach.

B. Terminology Used

The CPI is aggregated from “composite items”, which are defined as the most detailed level of aggregation for which weights are available from the Household Expenditure Survey (“Survei Biaya Hidup”). “Elementary aggregates” decompose these composite items by region. An example of an elementary aggregate in Jakarta is toothpaste.

In most cases prices are not collected for all the items which form part of an elementary aggregate, but only for a limited number of “representative items”, for which price movement is expected to be representative for all items in the elementary aggregate. For example, representative items for toothpaste in Jakarta may be the following three brands: Pepsodent, Close Up and Ciptadent.

C. Household Expenditure Survey

Household expenditure surveys are used to collect the information needed to calculate expenditure weights for elementary aggregates. Due to seasonal variations in expenditure, it is desirable that the household expenditure survey cover a whole year and provide information on regional expenditures by household characteristic. The "weight reference period" of the CPI is defined as the year during which the household expenditure survey is held.

Classification of expenditure used should match the needs of index construction. In many cases both a recall survey and a diary survey are taken. The diary survey is used to record smaller and frequent expenditures during a one- or a two-week period. It should be noted that even if the structural composition of expenditures changes only slowly over time, most countries undertake a household expenditure survey every four or five years, to be able to obtain an up-to-date set of expenditure weights. Taking a new expenditure survey is especially important after a period of crisis or following a period of rapid industrialization, because the pattern of household expenditure may have changed substantially since the last household survey was taken.

To be useful in computing weights, the tabulations from the household expenditure survey should include all reported expenditure, even though in the collection of prices for the computation of the CPI minor items of expenditure, whose inclusion would have no discernable effect on the index, may be excluded. This is done so that if an item becomes more important at a future time, expenditure weights would be available for that composite item.

The potential number of goods and services to be included in the household survey is quite large. To obtain an up-to-date list of expenditure items, large department stores and supermarket chains might be contacted.

It is also suggested that consideration be given to using a shorter form on which the enumerator indicates items which are bought less frequently, such as televisions and home computers, rather than pre-printing an exhaustive list of products and services, which would require a very large questionnaire for which maybe the majority of pages would have no entry. Instead, the enumerator could be provided with the detailed list of these less frequently purchased goods and services, which the enumerator would check if any purchases were made and then enter these items on the questionnaire under headings for the 3-digit major groups involved, together with the relevant codes.

D. Selection of Elementary Aggregates

Items for which prices might be expected to move in a different way from each other should not be grouped together in the same elementary aggregate. As an example, an item such as fountain pens (the "Parker" brand) should not be part of the same composite item as ballpoint pens, but instead be entered in the appropriate miscellaneous composite item, because of their low weight.

Although outlet-type sub-indexes are not required for publication, it may still be preferable in some cases to define separate elementary aggregates for some composite items which are disaggregated by outlet type, in addition to their disaggregation by region.

The classification of items into elementary aggregates should be such that, in addition to the aggregation to the CPI 2-digit and 3-digit group indexes, it should also be possible to aggregate to the National Accounts expenditure categories, so that consumer price indexes suitable for use as deflators may be calculated.

E. Selection of Representative Items

1. Item Specification

Item specification, which is provided centrally, tells the price collector what items are to be priced. There are two approaches to the selection of representative items, the statistical and the judgmental methods.

a. Statistical Method

The United States uses the Bureau of the Census Point of Purchase Survey (POPS) to obtain expenditure data. This sample survey provides expenditure estimates of consumer expenditure by item and by outlet. It is a quarterly survey with a 20 percent rotation in each quarter. Thus, a household remains in the sample during five quarters. The results of the survey are used to select outlets for price collection. The cost of taking a POPS is high, and the response burden is significantly higher than in a traditional household survey, because the name and address of the outlet for each recorded expenditure is collected. Note that traditional household surveys record only the type of outlet where purchases were made.

Information is obtained, for each item of expenditure, about the amount spent in each outlet, together with the names and addresses of these outlets. This provides a list of outlets with the total sales by each outlet for each expenditure item to the sampled households. The sample of outlets is drawn from this list proportionally to total sales. The estimator of the index for each item is then the average of the price relatives calculated for the outlets in the sample.

The price collector identifies the item without exercising any discretion at all if the specification is very tight. This is the case where a “representative item” is priced as in the POPS system of pricing. These specifications need to be very detailed for items such as women’s shoes. The effect of frequent changes in the representative items will be to increase the potential of quality bias.

Despite the statistical merits of this method, its implementation in practice is not easy, and also carries a high cost. That is why such an approach is not recommended for Indonesia.

b. Judgmental Method

With the judgmental method of selection, the variety chosen by the price collector in a particular outlet is a variety which is typical for that representative item, is likely to remain in stock for some time, and is of a quality which can be determined. When a whole range of qualities is available, the volume leader is in general chosen.

Implementing such a procedure can have major detrimental consequences if it is not carefully controlled. The choice of representative items must be carried out with extreme care and must be continually checked.

The representative items within the definition of the composite item could be selected separately for each outlet. This implies that the price collector or supervisor has to make these choices, as opposed to the sampling method, where the representative items are obtained by passing through a hierarchical series of statistical selections. If the variety to be priced is not specified precisely, the price collector has to choose the particular variety selected as a representative item. In this case the price collector should supplement the price information for the variety selected, by noting sufficient further descriptive details to provide a unique identification of the variety priced.

Without centrally provided specifications, the central checking of price collectors' reports will require that careful attention be paid to detailed item descriptions which the collectors would be required to provide as part of their reports.

Thus the judgmental method requires extensive knowledge on the part of the collector. A frequently used shortcut is to seek the best-selling variety of one of the best-selling items at the selected outlet to represent the representative item. In these cases it is necessary for the price collector to take account of the fact that what matters is not necessarily which variety sells the most, but which variety best represents the price movements for the representative item in its elementary aggregate.

2. Timing of Collection

If the aim of price collection is to compute a point-in-time index, the operation has to be spread over a small number of days each month. In the case of rapid inflation it is even more important to limit price collection to a few days each month. It should be noted that the interval between successive price observations at each outlet must be held constant. For example, prices could be collected on the 14th working day of each month and for another outlet on the 18th working day of each month.

F. Sources of Error

Four potential sources of error can occur in the CPI which need to be kept in mind:

- wrong expenditure weights: these are generally less important as a source of error in the CPI than errors in price collection, because if the errors in the weights are uncorrelated with price changes, which is usually the case, they will have little effect upon the index

- exclusion of new items: particularly if these items have substantially different characteristics than those included.

- changes in quality: this occurs when a quality change is not noticed and prices continue to be collected as if there had been no change in quality.

- asymmetry between the effects of rising and falling prices: while sellers may have no incentive to conceal falling prices, they may wish to conceal rising prices by applying them first on new varieties.

III. COMPUTATION

A. Computing Elementary Aggregate Indexes

An index is calculated for each elementary aggregate without using explicit expenditure weights for its components, because most often there will not be enough information for weights to be attached to the various representative items selected to represent a composite item. If it is known that sales of one variety are about double those of another variety, the first representative item could be given twice the weight in calculating the elementary aggregate. Such weighting could be based on sales or production data and might cover a later period than the weight reference period. Of course, the weight for the elementary aggregate must remain equal to its estimated share in total expenditures in the weight reference period.

Any such approximate weighting of the representative items within an elementary aggregate might create too much complexity if it were attempted separately for different geographical areas. It is preferable to use national information about the market shares of different representative items uniformly within all regional elementary aggregates, except in cases where this is clearly inappropriate.

Table 1 presents three methods of calculating an elementary aggregate index, each of which is presented using both arithmetic (A) and geometric averages (G). In the example it is assumed that the elementary aggregates are summed using equal weights. The table covers the case where there are no substitutions and no missing values.

1. Method 1A

This method uses the current to reference period relative of arithmetic average prices, which can be presented as:

$$I_{h,k,i,t} = \sum_{i} P_{h,k,i,t} / n \quad / \quad \sum_{i} P_{h,k,i,o} / n$$

where P refers to the price of a representative item
h the composite item
k the region or city
i the representative item
t the current period
0 the price reference period

Because this method compares averages of actual prices, it can only be used if the representative items included in the composite item are very homogeneous, for example when two or three varieties of apples are priced.

2. Method 2A

This method uses the arithmetic mean of month-to-month price relatives.

$$I_{h,k,i,t} = I_{h,k,i,t-1} \quad x \quad 1/n \sum_{i} (P_{h,k,i,t} \; / \; P_{h,k,i,t-1})$$

This method is not transitive. Transitivity refers to the property that if all representative prices were to have the same levels in the current period as in an earlier period, the index for the elementary aggregate should be the same.

3. Method 3A

This method uses the arithmetic mean of current to reference period price relatives.

$$I_{h,k,i,t} = 1/n \sum_{i} (P_{h,k,i,t} \; / \; P_{h,k,i,o})$$

This is the most commonly used method for calculating the CPI. It is the method used by the Prices Bureau to calculate the Indonesian CPI.

4. Geometric Means

For the three methods of index construction discussed above one can also use geometric means. Table 1 shows that all three methods give the same index levels as opposed to the arithmetic computations, where the levels differ for each of the three methods.

This is because the relative of geometric mean prices is equal to the geometric mean of their price relatives, i.e.

$$I_{h,k,i,t} = \frac{\sqrt[n]{\prod_i P_{h,k,i,t}}}{\sqrt[n]{\prod_i P_{h,k,i,0}}} = \sqrt[n]{\prod_i \left(\frac{P_{h,k,i,t}}{P_{h,k,i,0}}\right)}$$

Indexes using geometric means are not used at present by statistical agencies in calculating the elementary aggregates for the CPI. The use of geometric averages is therefore not recommended. However, for research purposes and as a check on the plausibility of the arithmetic calculations it is useful to have them available for comparison purposes[1].

B. Weights for the Elementary Aggregates

Consumer price indexes use weights which reflect the composition of the estimated aggregate expenditures of the reference population. This means that households with above-average expenditures will have an above-average influence on the weights and households with below-average expenditures will have a below-average influence on the weights. An example of the calculation of expenditure weights is given in Table 2.

The CPI is a weighted average of the price indexes for all the elementary aggregates. The elementary aggregate is thus the basic building block of the CPI, being an aggregate of purchases for a defined set of items (defined as a composite item) in a defined region at a defined set of outlet types. It is thus a cross-classification by type of item, by type of outlet and by region. If outlet type weights are not available, then elementary aggregates are defined in terms of type of item and region.

1 For a discussion of various methods of estimation see Ralph Turvey, *Consumer Price Indices*, International Labour Office, Geneva, 1989

The indexes for elementary aggregates may not be sufficiently reliable to be published, but the compilation of elementary aggregates is an essential step in using price observations so as to maximize the reliability of the group indexes and the all-items index. For example, if shoe polish is a minor item of expenditure, its weight could be included in the elementary aggregate called "household cleaning materials", but shoe polish would not be included as one of the representative items selected.

In other cases where a minor item is not clearly identifiable with any of the elementary aggregates, a separate elementary aggregate should be created. Examples are, "Other fruits" and "Other meat products". These elementary aggregates would have their price index imputed to be the same as the price index for the 3-digit grouping to which they belong.

But the collection of prices and the computation of the consumer price index should exclude minor items of expenditure, whose inclusion would have no discernable effect on the index.

Note that it is preferable not to allocate the weights for elementary aggregates for which no index is calculated over the other elementary aggregates in its 3-digit grouping. This is because in this way the weights used to represent the expenditures for each of the composite items remain equal to their weights in the household expenditure survey. Also, if such weights are kept separate, it is easier to use them at a later date if it were decided to start price collection for one of these composite items. In this way, the composite item "Other fresh fruit" could be split if one of the items included becomes more important over time. For example, the "Kiwi Fruits" item could be split off from the composite item "Other fresh fruit"

When no items are priced for an elementary aggregate, its price index is estimated implicitly by imputing its movement as that of the index for the higher level grouping to which it belongs. For example, "All other fruit" would use the index for the 2-digit grouping "Fruit", while "All other fresh fruit" would use the index for the 3-digit grouping "Fresh fruit".

C. Aggregation of Elementary Aggregates

If the weight reference period, i.e. the year that the household expenditure was taken, and the price reference period, i.e. the base year for the price indexes, are the same, then the all-items index for a specific city (k) is the sum of the current period to reference period price indexes for the elementary aggregates each multiplied by its reference period expenditure, divided by the sum of reference period expenditures.

$$I_{k,t} = \sum_{h} w_{h,k,0} \times I_{h,k,t}) / \sum_{h} w_{h,k,0}$$

where h refers to the composite item
k the region or city
t the current period

0 the price reference period

Because the sum of all the elementary aggregate weights is 1.000, the formula for the all-items index is:

$$I_t = \sum_h \sum_k w_{h,k,0} \text{ x } I_{h,k,t}$$

As shown in Table 3, these formulas are equivalent to the sum of the preceding month's revalued expenditure weights, as defined below, multiplied by its current to preceding month elementary aggregate index, divided by the sum of reference period expenditures.

$$I_{k,t} = \sum_h w_{h,k,t-1} \text{ x } (I_{h,k,t} / I_{h,k,t-1}) / \sum_h w_{h,k,0}$$

where

$$w_{h,k,t-1} = w_{h,k,t-2} \text{ x } (I_{h,k,t-1} / I_{h,k,t-2})$$

is the revalued expenditure weight for t-1.

Because at the all-items level the reference period weights sum to 1.000, the formula for the all-items index simplifies to:

$$I_t = \sum_h \sum_k w_{h,k,t-1} \text{ x } (I_{h,k,t} / I_{h,k,t-1})$$

This method is referred to as the modified Laspeyres method and is commonly used in calculating the consumer price index. It is also used in calculating the Indonesian CPI. An example of this method is given in Table 3.

Expenditures for elementary aggregates are additive, so the weighted arithmetic mean of a number of elementary aggregate indexes is used to calculate the indexes at the 3-digit, 2-digit, 1-digit and the all-items level.

IV. POTENTIAL BIASES

A. New Products

If a new good or service is so different from existing ones that it does not fit within any of the composite items distinguished by the index, it will not be feasible to include it until the next general re-weighting.

Maintenance of the index involves more than responding to changes. It also involves checking if there is a need to improve the system of weights. If the prices used to calculate an elementary aggregate index display dissimilar behavior, then obtaining weights to enable it to be split should be considered.

The introduction of new goods into the market raises an important problem for measuring the cost of living. If the composition of the CPI basket were rigidly fixed between basket updates, the current CPI would cover only those goods and services that were available at the time of the most recent expenditure survey. At present the Indonesian CPI does not cover certain types of electronics (such as home computers), telecommunications and some financial services.

The exclusion of new goods from the current basket would not be a source of measurement bias in the overall CPI if the prices of new goods changed at the same rate as prices of items included in the basket. Even if the relative prices of new goods decline significantly following their introduction, new goods bias will not be significant if new products account for only a small share of total consumer expenditures.

In most situations insufficient information is available to estimate expenditure weights for the new good. Even in these cases one should remain alert as far as consumer expenditure is concerned. That is, try to anticipate which items may be potentially added to the next household survey and start collecting data as if they are already included in the survey (but the data would only be used for internal processing).

Note that if a new good is not included in the current CPI, but a price series is available for this new good for a number of years before a new household survey is conducted, it will be possible to recalculate the CPI at the 3-digit and 5-digit level on the new basis for this earlier period. Such a series would be useful for analysis by the staff of the Prices Bureau. These alternative CPI time series could also be useful as deflators for the National Accounts.

In some cases it may be possible, between regular basket updates, to include new goods as additional representative items for a given elementary aggregate based on market information about the size of the expenditure shares for these new goods. One source might be sales data to consumers from large department stores. For example, Statistics Canada included Compact Disc players into the CPI in 1990, shortly after the 1989 household survey had been undertaken (the survey did not reflect any expenditures on CD players).

Another example where it might be feasible to include "new products" into the CPI, without waiting for the results of a new household survey, is the cost of fixed line telephone calls as opposed to the cost of mobile telephone calls. In this case substitution occurs between two closely related 5-digit items, which allows one to make an informed estimate of the relative share of expenditures for both the new product and the currently included product(s) which have lost market share, based on information from the telephone companies. In this case the new good would be included at the 5-digit level in the major group, i.e. the 3-digit level, to which it belongs, with a compensating reduction in the elementary aggregate weights for those goods which have seen their market share reduced as a result of the introduction of the new good. The weights at the major group level would of course remain unchanged.

One should stress that this approach (of allowing for the inclusion of new goods) cannot justify postponing the household survey, which is needed to update the weights for the CPI. In the United States such surveys are now conducted on a continuing basis, while in most other countries, the number of years between conducting a household survey does not exceed five years.

B. Missing Observations

When an individual observation is missing, because the price collector could not locate a particular item, it may be possible to use an imputed price, by assuming that the price would have moved at the same rate as the prices of other items which form part of the elementary aggregate. In this way the prices of comparable items are used to estimate a price for the missing item.

When a variety disappears permanently from an outlet, a substitute variety has to be found, unless a continuing reduction is accepted in the number of price observations on which the index is based. An example of this situation is presented in Table 4. Similarly, when an outlet closes down, one has to select a substitute outlet for the variety which was priced in it, so as not to reduce the number of price observations.

C. Quality Change

The CPI is intended to measure the pure price change for a basket of items through a comparison of the prices of goods of constant quality at different points in time. This implies that the observed change in price should be adjusted to exclude the effect of variations in the quality of the product between two periods. If no quality adjustments were made, the CPI would incorrectly treat price increases related to improvements in product quality as pure price increases, and movements in the CPI would overstate the true increase in the cost of living. It will be difficult to estimate the appropriate size of the adjustment for changes in quality, leading to a measurement error known as quality bias.

The current sample of priced commodities will provide a measure of pure price change if price comparisons between two periods relate to commodities of identical quality. However, if a new variety becomes the volume seller, substituting the new variety for the currently included variety may become desirable. Because there may well be a quality difference between these two varieties, a method to obtain price relatives must be found.

If it is not possible to find a variety which is of the same quality as the one to be replaced, so that its price can be used instead of the old one, the difference in quality between the old and the new variety has to be evaluated. In this case the problem is to put a monetary value on any differences in quality. For some items, such as automobiles, explicit quality adjustments may be made based on cost estimates provided by the manufacturer.

In most cases it is not possible to make such an explicit quality adjustment. A technique known as "splicing" may then be used to make an implicit adjustment for changes in quality. The splicing technique assumes that the entire price differential between the two varieties in the previous month was due to a difference in quality. This implies that the quality-adjusted price of the old variety in month t-1 is the product of its observed price and a quality-adjustment factor equal to the price ratio of the two varieties in period t-1. The month-to-month price change for the elementary aggregate is then calculated with the price of the new variety in month t-1 and the current month.

It should be noted that equivalence of quality-adjusted prices might not occur if special pricing strategies are in effect. For example, when a new variety is introduced, the price of the old variety may be lowered to reduce inventories. In this case, the ratio between the prices of the new and old varieties in period t-1 would overstate the true quality advantage of the new variety. These quality judgments can be avoided when there is an overlap in the availability of the old and the new variety so that prices for both can be obtained at the same time. In this case one can take the price difference as a measure of the quality difference.

A decline in the relative importance of a representative item also raises the question of replacement, though not with the same urgency. An important part of the work of the supervisors and the central office is to select substitutes or to ensure that the price collectors select them before the original item is no longer available. This means that the office must accept that part of its task is to follow what goes on in retail outlets, to be aware of new shopping trends and the availability of new products.

The above discussion referred to quality changes within elementary aggregates. There are, however, some more fundamental changes which cannot be dealt with by substituting items included in the same elementary aggregate. These would require a new set of weights, with the revised index chained onto the old one.

Hedonic pricing models offer a potential alternative to the conventional methods of quality adjustment. The hedonic approach uses a regression equation in which the price of a good is a function of its most important quality attributes. The implicit contribution of each quality attribute to the market price can be estimated with the price and quality data for a variety of different models of the good. These estimates can be used to adjust observed prices for changes in product quality. A limitation of the hedonic technique is the need to identify and collect data on all quality attributes which have a significant effect on market price.

D. New Outlets

Price data for most items in the CPI are collected from a sample of retail outlets consisting of the high-volume sellers of each commodity. Originally these outlets would have been selected on the basis of information from the household survey. This sampling procedure will give the pure price change if prices at the sampled outlets are representative of prices at both sampled and non-sampled outlets. However, if new outlets are opened which have a different pricing pattern, the CPI will contain a measurement error called “outlet substitution bias”. Thus new retailers, the opening of new supermarkets and the construction of new shopping malls can bring about the need to change the sample of outlets from which prices are collected.

Conceptually the introduction of new outlets is similar to the inclusion of new varieties of representative items in the index. In other words, the new outlets would be included using their price relative between month t-1 and t. If information as to the market share of these new outlets is available, this can be taken into account in aggregating to the index for the elementary aggregate.

If the market share of one type of outlet increases substantially, it may be worthwhile to split the elementary aggregate, linking the weighted average of the new elementary aggregates to the previously combined elementary aggregate.

A problem arises with the disappearance of a particular variety from a selected outlet or the closure of an outlet, since this prevents the desired matching of the current price with the previous price. If the disappearance is expected to be short lived, for example because the outlet is closed for repairs, the item can be temporarily omitted in calculating the elementary aggregate. But if this is not the case, the question is whether to replace the item with a substitute or to accept that the number of representative items for the elementary aggregate is reduced.

V. CONCLUDING REMARKS

The interest in the size of the various biases which might affect the level of the CPI, increased dramatically since the publication in 1996 of the Boskin report on the CPI in the United States.[2] That report estimated the annual effect of new outlet bias to be 0.1 percent, the effects of quality change and the introduction of new goods to be 0.6 percent and the effect of changes in weights to be 0.4 percent, for a total overstatement of 1.1 percent. Overall the cumulative effect on the level of the CPI in Indonesia of the three biases discussed is probably less than in the United States, because the importance of the food components is much larger in Indonesia.

A serious study of the effect of these issues requires undertaking continuous market intelligence to increase awareness of new trends in consumer expenditures. This requires a) vigilance and b) additional budget to cover items which are added to the goods and services for which prices are collected between household surveys. This is a research function which may or may not result in changes in the way the CPI is obtained, but that in our view BPS is best placed to (and should) undertake.

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[2] Advisory Commission to Study the Consumer Price Index, *Toward a More Accurate Measure of the Cost of Living*, Final Report to the Senate Finance Committee, Washington DC, 1996

CONVERTING THE WHOLESALE PRICE INDEX INTO A PRODUCER PRICE INDEX

Report # 27

by
John Kuiper

March, 2001

Statistical Assistance to the Government of Indonesia (STAT) Project
USAID Contract No. PCE-I-00-99-00009-00

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I. INTRODUCTION

BPS publishes a monthly Wholesale Price Index (WPI). The most recent issue covers the years 1997-1999.[1] Traditionally wholesalers played the principal role in sales to retailers. However, new distribution methods have surfaced in the past decade, particularly in manufacturing, whereby output is sold directly by the producer to the ultimate buyer. In these cases, data on commodity prices are collected by BPS directly from the manufacturer. Thus wholesale price statistics are currently collected both from traditional wholesalers and in some cases from producers.

Because of the increasing role of direct sales by producers, the Prices Bureau of BPS is considering the feasibility of converting the current WPI to a Producer Price Index (PPI). One significant advantage of such a conversion would be that it makes it possible to directly aggregate by ISIC, making such measures more compatible with other industry-based economic time series, such as the series on production, employment, wages, earnings and productivity. Another advantage of a PPI series to users is its potential use as a leading indicator of inflation. It is worth noting that producer price statistics are already published for the agricultural sector based on data from the Farmers' Terms of Trade survey.[2]

This report discusses a select number of conceptional issues involved in the calculation of a producer price index and differences between a wholesale price index and a producer price index.

II. COVERAGE

A. WPI

The Prices Bureau publishes a monthly WPI. This publication covers 327 commodities from five sectors: agriculture, mining, manufacturing, exports and imports. In addition, indexes are produced by end use and by stage of processing for these five sectors. The wholesale price indexes are published at the national level only.

Weights used in the calculation of the WPI are the value of sales for the commodities marketed by wholesalers, or if appropriate, the producers. However, with the increasing importance of the manufacturing sector, and in recent years the greater importance of new

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1 *The Wholesale Price Indices of Indonesia (1993=100)*, 1997-1999, Badan Pusat Statistik, 2000

2 *Statistik Harga Produsen Sektor Pertanian di Indonesia, 1996-1999*, Badan Pusat Statistik, 2000

channels of distribution at the retail level (such as supermarket chains and department stores), it has become more common to find industries where the wholesale trade sector plays a less important role than before. This is one of the reasons why more and more countries are replacing the WPI with a PPI. One of the key differences between these two indexes is that the WPI uses wholesalers' sales as the basis for aggregating lower level indexes, while the PPI uses producers' sales.

At the lowest level of aggregation, i.e. the 5-digit ISIC and the 5-digit International Standard Commodity Classification (ISCC), there may exists a one-to-one relationship between the industry and the commodity classifications. This would be the case if a commodity is produced in only one industry, for example cold rolled steel. On the other hand, a commodity such as wooden chairs might be produced as a secondary product by an establishment whose principal product is the manufacture of metal chairs.

This implies that if, for example, aggregate indexes are required at the 3-digit level of the industrial classification, it is not appropriate to use price indexes aggregated by commodity (as the WPI does), because commodities may be produced by more than one industry. In other words, at higher levels of aggregation it will be more difficult to match price indexes on a commodity basis with ISIC-based volume or value measures.

B. PPI

Producer price indexes classified by industry cover industrial production, using relative shares in the ISIC as the basis for aggregation. In the United States, the Bureau of Labor Statistics (BLS) publishes the "Producer Price Index," but this index was known until 1978 as the Wholesale Price Index. The name was changed because the weights used in the aggregation process at that time were already based on net sales by industry.

Producer price indexes may be classified by industry, by commodity and by stage of processing. All these indexes draw upon the same set of price information collected from establishments. The PPI for an industry is a measure of changes in prices received for the industry's output, excluding intermediate use by the industry itself. The PPI for commodity categories aggregates prices for the same commodities even if produced in different industries.

In most countries producer price indexes, whether commodity- or industry-oriented, are national rather than regional in scope. This is because the geographic disbursement of manufacturers and the number of producers in different regions does not provide a sufficiently strong data base to provide separate regional indexes. One reason is that sometimes production is concentrated in a particular region of the country, either because the raw materials are only available in that region or for historical reasons. Also the number of establishments in a region may well be small, while in many cases producers' sale prices are similar throughout the country.

Regional indexes may be produced for unique products such as concrete pipes, which are used across the country and which for technological or cost reasons are mainly sold within the same region. On the other hand cement, even if produced in different provinces, would manifest the same pricing patterns across the country because its cost of transportation relative to the producers' price is low.

C. Potential Uses of the PPI

The PPI may be used by economists as a leading indicator of inflation as measured by the CPI. It may also often used to measure the international competitiveness of a country. Because producer price indexes are available by industry, they are more suitable than the wholesale price index for deflating the national accounts and input-output tables.

The PPI also allows aggregation by ISIC, which provides measures more compatible with other industry-based economic time series, such as the series on production, employment, wages, earnings and productivity.

III. PPI COMPUTATION

This section provides a brief review of critical elements of procedures used for computing the PPI followed by two statistical agencies with well-established statistical programs in this area, namely the US Bureau of Labor Statistics and Statistics Canada.

A. Sampling Methodology

As a first step the total number of price observations has to be determined. This is done based on the value of output for the elementary aggregate, and a judgment of the likely dispersion of price movements in the sample. In the next sampling round an estimate of the variability of the sample is used to replace the judgmental assessment on which the initial allocation was based. In other words, if no information on price dispersion in an industry is available, an initial judgment is made on the basis of related information, but once prices have been collected for one or two years it will be possible to estimate the variance of the prices in that industry.

Depending on the industry, each respondent is asked to provide from two to four price quotations for different representative products depending on its size and the range of products that it produces. The total sample size is then obtained as the number of price quotations required divided by the number of price quotations per respondent.

The sampling frame is taken from the most recent census of manufacturing. For each elementary aggregate, the values of all establishments reporting sales of any of the products included in the elementary aggregate are listed by their commodity classification code.

The percentage of total value applicable to each establishment is calculated, and the establishments which together account for less than say 10% of the value of output are excluded. This excludes most of the smallest establishments, and helps assure that in the estimation process no single observation carries a weight disproportionate to the importance of its production.

Once the sample frame has been determined, a sample of potential respondents is drawn in two stages. First those establishments which are relatively large, or are essential to ensure that a particular representative product is included in the elementary aggregate, are selected. As these establishments represent only themselves, they are weighted by their value of sales. From the remaining list of establishments the rest of the required number of respondents are drawn by simple random sampling. They are weighted by their value of sales multiplied by the ratio of the value of sales of all potential respondents to the value of sales for those actually drawn.

If the output of an elementary aggregate is relatively small, simpler methods are used. For example, their price movement may be imputed based on the price movement in larger elementary aggregates.

B. Price Collection

The respondents are contacted so that a detailed description of the physical variety sold and the terms of sale may be specified for each product to be priced by that respondent. In most cases, the specific quotation chosen pertains to the sale of a major product line to a major type of customer.

The appropriate valuation of prices to calculate the PPI should be ex-factory. Thus several parts of what a purchaser may pay are not included in the price measure used. Costs excluded are 1) indirect sales taxes, 2) transportation services provided by a common carrier and 3) the distribution services performed by wholesalers.

Once there is agreement on which price information is to be supplied, the price quotations are collected monthly. The respondents give the sales price for new orders as of a specific date, for example the 15th of each month, or on the last business day before this date. The prices requested are for new orders, but for commodities where there is a very short lag between an order and its shipment date, the prices for new orders and shipments may be regarded as the same. On the other hand, when the production process is relatively long, the prices for new sales and actual shipments may vary substantially.

In the subsequent validation of the regularly supplied price quotations, one of the most important concerns is that the prices quoted are those actually prevailing in the market. That is to say that the reported prices must reflect discounts, promotions etc.

In the compilation of indexes for the elementary aggregate, emphasis is to be placed on the critical examination and evaluation of prices. Reported price changes must be evaluated, but also periods of no reported change, both to validate them directly and in the context of their representativeness of the product price movement as a whole.

Apart from the regular editing of reported data there are potential biases due to changes in quality, missing data, disappearance of products, and the appearance of new products. In these situations procedures similar to those applied in the compilation of the CPI may be used.

C. Elementary Aggregate Indexes

An index is calculated for each elementary aggregate by aggregating prices for its representative items. The elementary aggregate is thus the basic building block of the PPI, being an aggregate of "net output sales" or "net output shipments" for a defined set of representative items. The procedures used are similar to those applied in calculating the consumer price index, except that for the producer price index weights based on sales or production data may be available for the representative items.

The method most often used to calculate elementary aggregates uses the arithmetic mean of current to reference period price relatives, i.e.

$$I_{h,k,i,t} = 1/n \quad (P_{h,k,i,t} \; / \; P_{h,k,i,o})$$

where P refers to the price of a representative item
h the commodity
k the industry
i the representative item
t the current period
0 the price reference period

D. Aggregation of Elementary Aggregate Indexes

Unlike the CPI, for which the weights are obtained from a separate household expenditure survey, the weights used for the PPI can be derived from data in the Census of Manufacturing, the Census of Mining and the Census of Agriculture. Most countries use "net output shipments" as weights. "Net output shipment" values are defined as sales from establishments in one industry to establishments in other industries or for final demand. "Net output shipment" values differ from "gross shipment values" by excluding shipments among establishments within the same industry. The net output for total manufacturing, for example, is the value of manufactured output sold to purchasers outside the manufacturing sector. Instead of using sales, the producer price indexes may use the value of industry production as weights, where production equals industry sales less changes in inventories.

Some countries, Canada among them, use the production values from the input-output table as weights, instead of "net output" values. The United States uses "net output shipment" values, but also calculates industry indexes using industry flows from their input-output table.

Aggregate indexes may be obtained as the sum of the preceding month's revalued "net output shipment" weights, as defined below, multiplied by the ratio of its current to preceding month elementary aggregate index, divided by the sum of reference period net output shipments value weights. The PPI is a weighted average of the price indexes for all the elementary aggregates.

$$I_{k,t}=\left(\frac{\sum_{h} W_{h,k,t-1}\left(\frac{I_{h,k,t}}{I_{h,k,t-1}}\right)}{\sum_{h} W_{h,k,0}}\right)$$

where h refers to the commodity
k the industry
t the current period
0 the price reference period

and

$$W_{h,k,t-1}=W_{h,k,t-2}\left(\frac{I_{h,k,t-1}}{I_{h,k,t-2}}\right)$$

is the revalued shipment weight for t-1.

The formula for the all-items index is:

$$I_t=\sum_{h}\sum_{k} W_{h,k,t-1}\left(\frac{I_{h,k,t}}{I_{h,k,t-1}}\right)$$

This method is referred to as the modified Laspeyres method and is commonly used in calculating the producer price index.

IV. CONCLUDING REMARKS

This report provided a brief discussion of the differences between the PPI and the WPI. The biggest advantage of the PPI is that at higher levels of aggregation, it is based on ISIC weights, which makes it more compatible with many industry-based economic time series (e.g. production, employment, wages, earnings, productivity) than the WPI. Thus it allows direct measurement of prices by industry (ISIC) aggregates. Various countries, the US and Canada among others, have successfully converted their onetime WPI into a PPI with relative ease. There is no reason why Indonesia cannot do the same, particularly since appropriate weights can be derived from existing sources (censuses of manufacturing, mining and agriculture). The steps for undertaking such a conversion were described in Section III above. Until it is decided to convert to calculating a PPI, BPS may want to consider interim steps such as the evaluation of differences between price data for individual commodities from the monthly and quarterly survey of manufacturing and the WPI.

AN INTERACTIVE SURVEY QUESTIONNAIRE FOR THE BADAN PUSAT STATISTIK OF INDONESIA

Report # 29

by
Bruce A. Johnston

March, 2001

Statistical Assistance to the Government of Indonesia (STAT) Project
USAID Contract No. PCE-I-00-99-00009-00

EXECUTIVE SUMMARY

The consultant was engaged to assist the Badan Pusat Statistik (BPS) in assessing the possibility of creating a "dynamic" website which will allow the creation, processing and maintenance of interactive paperless questionnaires using the Internet and the World Wide Web. The work was done over a 12 day period in Indonesia in March, 2001. The work was done under the authority of Purchase Order No. #5375-105-P-001 issued by Development Alternatives, Inc. on 1 March 2001.

In 1994 the consultant assisted BPS in developing their five year computerization improvement plan, so he was already familiar with many BPS Information Systems operations and had worked with several individuals contacted in the course of this engagement.

The main deliverable of the engagement was an operational Internet web page permitting interactive data entry for a statistical survey to be specified. In the course of the development the consultant was to evaluate existing BPS website programming operations, to evaluate existing website hardware systems, and determine the technical requirements for the creation of an interactive paperless questionnaire system.

The web page was delivered on 8 March 2001 and was demonstrated on a working web server on 15 March.

To carry out the requirements of the engagement the consultant worked closely with three bureaus in BPS;

- the Dissemination Bureau, (Bureau for Presentation and Statistical Services/Biro Penyajian dan Pelayanan Statistik), responsible for data publication and distribution, and web site development,

- the Bureau for Statistical Information Systems (ROSIS), responsible for providing the technical infrastructure; servers, communications etc., for BPS internet activity, and

- The Price Bureau (Biro Statistik Harga dan Keuangan), the user of the selected sample web based interactive questionnaire.

A summary of the consultant's findings and conclusions appears in sections 3, 4 and 5 below. Because of the short duration of the engagement the consultant does not feel that it is appropriate to make specific recommendations for improvements in IT operations to support increased Internet use: more analysis and research is needed to be assured of making practical and well founded technical and management recommendations.

The consultant's fundamental conclusions were:

- There are no significant technical or capacity constraints to increase internet and web utilization by BPS at this time, and

- There are significant management and corporate culture issues that need to be addressed to improve the efficiency of BPS IT activities.

The consultant appreciates the contributions of the following BPS staff to this engagement and extends his thanks for their assistance:

- Dr. Ali Rosidi, Director, and J.A. Djarot Soetanto, Head, Financial Statistics division, of the Price Bureau

- Mr. Subagio Dwijosumono, Director, Mr. Iwan Hermanto, and Dr. Satwiko of the Dissemination Bureau.

- Mr. Agus Suherman, Director; Rudy Dharmawan, and Budhi Isworo, of the Bureau for Statistical Information Systems

Mr. Idaman, without whose assistance and guidance this engagement could not have been completed in the time available.

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I. CONDUCT OF ENGAGEMENT

Several interviews and meetings were held with the managers and senior staff of the three bureaus listed above, to obtain the information necessary to carryout the TOR of the engagement, determine their internal capabilities to support web based operations, and ascertain BPS plans and expectations for increased use of the Internet for data collection and interaction with BPS respondents and customers.

In addition the consultant reviewed reports from two previous consultancies which have bearing on Internet use by BPS:

- *"Computerization Improvement Plan For The Central Bureau Of Statistics Of Indonesia (Buro Pusat Statistik) In Accordance With The Repelita Vi Five Year Plan"*; Bruce A. Johnston, March, 1994. This report provides a basis for understanding the evolution of BPS from a highly centralized main frame IT environment to today's distributed client-server environment. The report also covers the national data communications situation as of that time.
- *"Indonesia: IED Assessment",* R. Nathan Associates, January – February 2001. Includes a thorough assessment of the current state of data communications and Internet capabilities in Indonesia.

The interactive questionnaire web page was completed and initial delivery made on Thursday, 8 March. A full demonstration, including data entry and analysis of sample data entered was given on Thursday, 15 March. Full HTML source code was turned over to BPS at the same time.

It was desirable to work through ROSIS and the Dissemination Bureau (see details below) to provide support for web site implementation and technical support. In the course of the engagement information was collected regarding the technical capabilities and management constraints affecting these organizations and the general IT situation in BPS. These are described below.

In the end ROSIS was unable to support installing the test web site on their facilities, the internet connection, and demonstration of the interactive questionnaire, in the time needed, so the demonstration was performed using a test web server and work station installed on the STAT Project office computers.

II. ANALYSIS AND DEVELOPMENT DETAILS

The weekly foreign exchange rate survey questionnaire was selected for interactive questionnaire development. This survey was chosen because it is a relatively simple form with a moderate input volume, and contains most of the features necessary for expanding interactive questionnaires to other surveys within the bureau and throughout BPS.

The Price Bureau has no internal IT or web site development capability and at this time no internal Local Area Network (LAN). Therefore they must rely on the Dissemination Bureau for web site development and maintenance, and on ROSIS for Internet access and establishment of their web server. The bureau plans to acquire its own internal LAN.

Enumerators do the Forex rate survey in the field and deliver hard copy data to BPS provincial offices where it is compiled and entered into Excel spread sheet forms for transmission to the head office in Jakarta. The spread sheets are usually attached to email, but hard copy is also faxed because BPS requires authenticated hard copy backup of source data, i.e. a completed form stamped by a respondent official. Figure 1 below is the current form in use.

A. Price Bureau

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Survei kurs uang asing	
menurut jenis uang asing	tahun 2001 keadaan bulan ....C:\WP51file\foreign-exchange.wp9
telpon & fax perusahaan	---
nama perusahaan	---

Minggu		Dollar Amerika		Dollar Australia		Shilling Austria		Gulden Belanda		Franc Belgia		Dollar Brunei	
Ke –	hari tanggal	(USD)		(AUD)		(ATS)		(NLG)		(BEF)		(BND)	
		Beli	Jual	Beli	Jual	Beli	Jual	Beli	Jual	Beli	Jual	Beli	Jual

Minggu		Dollar Canada		Kroner Denmark		Dollar Hongkong		Poundsterlin		Lira Italia		Yen Jepang	
Ke –	hari tanggal	(CAD)		(DKK)		(HKD)		Inggris (GBP)		(ITL)		(JPY)	
		Beli	Jual	Beli	Jual	Beli	Jual	Beli	Jual	Beli	Jual	Beli	Jual

Minggu		Mark Jerman		Ringgit Malaysia		Dollar Selandia		Kroner Norwegia		Franc Perancis		Peso Philipina	
Ke –	hari tanggal	(DEM)		(MYR)		Baru (NZD)		(NOK)		(FRF)		(PHP)	
		Beli	Jual	Beli	Jual	Beli	Jual	Beli	Jual	Beli	Jual	Beli	Jual

Minggu		Dollar Singapura		Franc Swiss		Kroner Swedia		Riyal Saudi		Bath Thailand		Euro	
Ke –	hari tanggal	(SGD)		(CHF)		(SEK)		Arabia (SAR)		(THB)		(EUR)	
		Beli	Jual	Beli	Jual	Beli	Jual	Beli	Jual	Beli	Jual	Beli	Jual

Figure 1 : Forex Rate Survey Questionnaire

about 400 Forex rate survey questionnaires are requested each week, about 300 of which are from money changers. About 67% of the responses are received on time. The size of the survey sample is decided periodically by the Price Bureau. After a period of flux, Price Bureau plans to establish strict weekly input of rates every Wednesday. The plan is to replace the emailed spread sheets with data entered on the web based interactive questionnaire at the provincial offices.

B. Dissemination Bureau

In addition to its data publishing and dissemination activities, the bureau was recently made responsible for all Internet web site development for BPS. It appears that this responsibility was recently passed from ROSIS, but no technical staff were transferred with the responsibility. However the bureau does have several capable individuals and, in fact, has been supporting BPS's main web site at <http://www.bps.go.id/> for many years. Figure 2 below is the home page of the BPS web site.

The web site is a static display of statistical information except for a brief comment page, and is not changed very often except for periodic data updates. The web site receives about 200,000 hits per month. The consultant was advised that there would be many more hits, but the poor quality and availability of communications lines and ISPs in Indonesia made attempts by users to access the web site time consuming and frustrating. Users outside of Indonesia do not have similar problems[1].

The web site receives an average of 200,000 hits per month, transferring about 3Gb of data per month, or 15kb per hit. Almost all the transfers are outgoing, very little data comes in[2]. From the size of the web pages it is estimated that less than 20%, or 40,000 hits per month, are substantive information accesses. The remainder are redirections or mistakes where the user exits the site immediately after the home page is displayed. From this analysis the consultant concludes that BPS has sufficient capacity to absorb significant additional web traffic – the additional volume of a few low volume survey interactive questionnaires would hardly be noticed.

1 The consultant has been checking the BPS web site from the USA, Ukraine and other countries for several years with little difficulty.

2 The BPS web site has only one comment page for input, which is not used very often.

Figure 2 : BPS Home Page

In the Dissemination Bureau discussions it was repeatedly emphasized that money is a significant problem. As the consultant's analysis continued it became increasingly clear that references to money were not related to funding, but to increased generation of revenue by selling data to external public and private sector customers. In that regard the bureau has been developing a "Data Warehouse," called "SiRusa," in essence a statistical clearing house and repository of statistical data to be made widely available. The development is mainly conceptual, on paper, at this time, although they assure me that quite a bit of actual development work on the test relational data base management system (RDBMS) and internet web sites for data collection and dissemination has been done.

Although Dissemination Bureau now has responsibility for developing and maintaining web sites for users throughout BPS, It appears that the Price Bureau has not received assistance in their development endeavors.

C. Bureau of Statistical Information Systems (ROSIS)

ROSIS is the successor of the old mainframe based BPS IT organization. The NEC mainframe was eliminated a few years ago and all systems are now distributed client server based in accordance with the original five year plan. They now have approximately 40 servers, and maintain the data communications network througout BPS head office. Time did not permit getting into details of distributed system implementation in provincial and regional BPS offices, but it appears that all of the provincial offices and some other offices have LAN or client server based systems. Provincial and regional BPS offices use local ISPs.

It is not yet clear what effect, if any, the recent transfer of substantial authority from the central government to the provincial governments will have on BPS field offices and their IT situation.

ROSIS is responsible for access to BPS's data communications network, and in principle wants everybody to have their own server; virtual servers using the ROSIS hardware. In ROSIS's view users setting up their own systems have poor development and maintenance capability and ROSIS can't always respond quickly to user problems because they have their own work to deal with. But subject matter bureaus can and do set up their own systems, and they do have IT technicians on staff, sometimes under different job titles. Many subject matter bureaus in BPS have their own systems and LANs, and maintain their own data bases with internal technical staff. Several of the revenue producing subject matter bureaus, such as Industrial and Social statistics, have been running their own systems for many years.

The bureau uses many different server and network operating systems, including varieties of UNIX, Microsoft NT server and Red Hat Linux. Time did not permit a closer examination of the actual utilization of the various systems, but a walk through the computer room confirmed that they have servers running on at least six different operating and network systems. ROSIS staff confirmed that the multiplicity of servers and operating systems is a significant problem. Under GOI procurement practices, hardware is usually purchased as an all-inclusive turn key package, and whatever operating system and version is current at the time of delivery is what ROSIS receives. Maintaining operations and connectivity of such a system is a major drain on scarce technical resources, but rationalizing the situation would be difficult and time consuming because of the technical constraints of different internal access methods and data management and formatting.

However there is currently sufficient storage capacity for operations and, it is estimated, for the next five years at the current rate of growth. Current email and web server activity uses less than 10% of system capacity. Storage capacity could be extended by storing less used, older statistical data sets off line on tape – at this time all data sets are stored to be accessible on line. This, of course does not include many large data sets resident on systems in the subject matter bureaus, e.g. industry, social statistics, etc.

Sybase SQL Server is the RDBMS standard, and Powerbuilder, Clarion, and FoxPro are used for applications.

ROSIS management says that they don't really have enough experienced technical staff to deal with the more esoteric aspects of Unix and SQL Server, and can't bring in outsiders because of difficulties in hiring local consultants. In their opinion there are no local consultants, and few supplier technical experts, who are more capable and experienced than ROSIS technicians. Local hardware support is satisfactory, communications and system software support is chancy or non-existent.

There appears to be a significant problem with the Internet Service Providers (ISPs) that BPS uses. There are two; Telkom (Wasantara) for domestic traffic, and Indosat (IPTechnet) for remote domestic and international traffic. Each ISP in itself is satisfactory, but severe response problems seem to arise when it is necessary for BPS traffic to route between the two ISPs, and like all users, BPS has little control over message routing on the Internet.

It was noted that system backups are not stored off site, and it appears that backups are not regularly scheduled, but are done on a server by server basis when it becomes necessary to consolidate and regenerate the data bases.

ROSIS has no official application development responsibility; this function was recently passed to the Dissemination Bureau.

D. Web Page Development

The consultant developed the interactive Forex rate survey questionnaire web page shown in figure 3 below, which is functionally the same as the spread sheet template supplied (Figure 2 above), but rearranged for efficiency and to fit the parameters of a web page.

Survei Kurs Uang Asing **Foreign Exchange Rate Survey**

Menurut jenus uang asing

Nama perusahaan

Name of person preparing questionairre

Telepon Fax Email

Tahun 2001 keadaan bulan January Hari date dd/mm/yy

Uang		Beli	Jual	Uang		Beli	Jual
Dollar Amerika	USD			Shilling Austria	ATS		
Dollar Australia	AUD			Franc Belgia	BEF		
Dollar Canada	CAD			Dollar Brunei	BND		
Dollar Hong Kong	HKD			Kroner Denmark	DKK		
Poundsterlin	GBP			Lire Italia	ITL		
Yen Jepang	JPY			Kroner Norwegian	NOK		
Mark Jerman	DEM			Franc Perancis	FRF		
Ringett Malaysia	MYR			Franc Swiss	CHF		
Dollar Selandia	NZD			Kroner Swedia	SEK		
Peso Philipina	PHP			Riyal Saudia	SAR		
Dollar Singapura	SGD			Euro	EUR		
Baht Thailand	THB			Gulden Belanda	NLG		

Place instructions here

Submit Reset

Click here to go home

The web page was actually developed as part of complete web site for the Price Bureau, but except for the Forex form, the web pages are only interlinked stubs to provide navigation for further development. Figure 4 is a schematic diagram of the web site.

Microsoft FrontPage 2000 was used for the initial web design and development and testing. The completed web, including HTML source, was then transferred to the Cold Fusion web authoring system which is the BPS standard. HTML source code in *.txt format requires over 100 pages to print so is not included with this report. It is available on diskette from the STAT project office, ROSIS and the Dissemination and Price Bureaus.

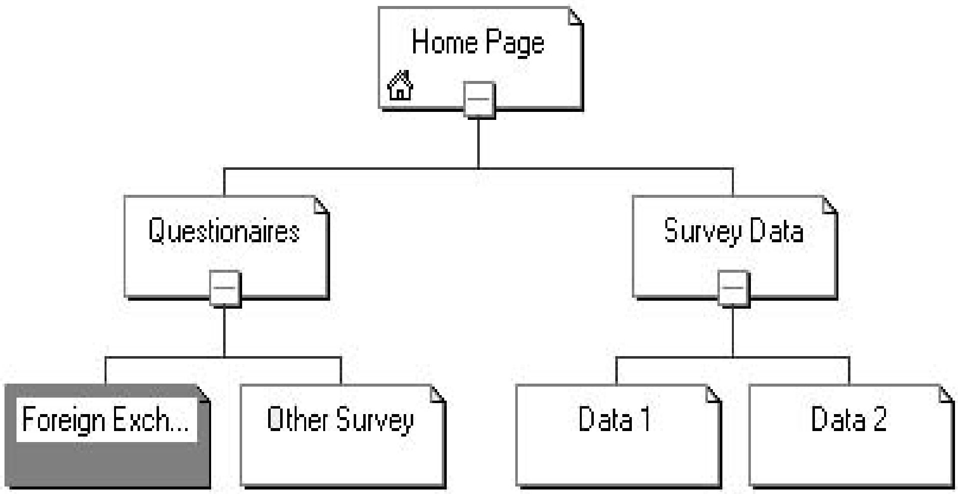

Figure 4 : Price Bureau Skeleton WebSite

III. CONCLUSIONS ON BPS WEB ACTIVITY AND INTERACTIVE QUESTIONNAIRES

- Beyond some experimentation and testing there appears to be little web development activity in BPS at this time. The only significant activity seems to be periodic updating of the data displayed on the existing BPS web site.
- A few subject matter bureaus have also established small web sites with their own ISPs, outside of ROSIS and the Dissemination Bureau.
- There do not appear to be any significant technical or capacity constraints to substantial increases in BPS web site development activity.

- Internet/web based interactive questionnaires can provide several benefits to BPS:

  . Consistent data content and formatting on both simple and complex questionnaires,

  . Possibilities for increasing direct input from survey respondents, reducing field enumeration requirements,

  . Reduction in the data entry work load in field offices,

  . Ease of making changes to questionnaires on short notice,

  . Ease of development of ad hoc and special surveys, and

  . Improved response and timeliness.

- BPS IT capacity in itself does not seem to be a constraint in using interactive questionnaires, and the user learning curve (i.e. in subject matter bureaus) for simple web development tools, such as Microsoft FrontPage, is short.
- While the Allaire Cold Fusion web development software, standard in BPS, has more capability than FrontPage, it's learning curve is substantially greater than the simpler tool and it requires greater technical ability to use effectively. It is not clear to the consultant that this greater capability is actually needed for most potential BPS web developments.
- Under the constraints of band width and quality and speed of communications in Indonesia, at this time the practical use of Internet/web based interactive questionnaires is probably limited to low volume and ad hoc surveys.
- Complex questionnaires probably will continue to require the use of trained enumerators to assure correct interpretation of the questions and consistent responses.
- It is not clear that using interactive questionnaires will benefit large, complex data collection efforts such as the annual industrial and agricultural surveys or the census.
- The use of interactive questionnaires will require the implementation of access logging, tracking and security protection, such as user Ids, passwords and cookies, to prevent input of spurious and duplicate data.

IV. GENERAL FINDINGS ON BPS IT ACTIVITIES

- BPS changed from a mainframe computer to a distributed computing environment to get the economic and technical benefits of personal computers, local area networks, and now, the Internet.
- The result of this change is that BPS overall has greater data processing capacity than ever before.

- BPS revenue from the national budget has been steadily reduced for the last few years, and reductions are expected to continue in the future.
- BPS generates revenue from outside sources to maintain and improve operations.

  . Many subject matter bureaus are selling data, and the distributed computing revolution has permitted them to increase revenue from outside sources.

  . There is active movement by other bureaus to get into the revenue stream by selling their data.

  . Non-subject matter bureaus, and those subject matter bureaus who cannot charge for their data products, are largely left out of this revenue stream.

- The practical result of these conditions are:

  . BPS is in practice a decentralized IT environment. Independent data processing units exist, are planned, or desired, in practically every bureau in BPS.

  . ROSIS is not perceived as a reliable source of IT services and support. If it were, the subject matter bureaus would not be going to the expense and effort of building their own IT capabilities, they would be using ROSIS facilities.

  . While there are inefficiencies in technical IT support because of the many different systems in use, in fact the statutory and revenue producing products of BPS are being produced.

- One specific issue confronting BPS is development and implementation of a centralized “data warehouse”. Some design work and experimentation has been done in the Dissemination Bureau and ROSIS over the past 18 months on the Sistem Informasi Rujukan Statistik (Statistical Clearing House Information System, or “SiRusa”). However it is not clear that a number of fundamental management questions have been answered. For example,

  . Has BPS management unequivocally approved SiRusa development and implementation?

  . Is there a market outside of BPS for access to SiRusa?

  . Will revenue from external users offset the cost of development and operations?

  . Will subject matter bureaus cooperate by (1) allowing their data to be copied into, or accessed by, SiRusa? Or (2) willingly transfer their existing data sets into SiRusa?

. Does BPS have enough internal technical resources to develop and operate such a complex and sophisticated system?

- Another issue is the potential impact of the Internet and World Wide Web on BPS operations, and opportunities for revenue generation.

 . What is likely to be the impact on operations and costs, of data collection via the internet?

 . What is likely to be the future impact on operations and revenue from data dissemination via the internet?

V. GENERAL CONCLUSION ON THE BPS IT SITUATION

1. The personal computer and distributed data revolution has had a profound effect on BPS organization, methods, and corporate culture over the last 10 – 15 years.
2. An unintended result of the revolution has been increased autonomy of subject matter bureaus, and corresponding decentralization of IT activities and capacity through increased control of data by subject matter bureaus.
3. The decentralization of IT operations and statistical data sets in subject matter bureaus appears, overall, to be beneficial to BPS's mission and revenue generation capability.
4. Insofar as decentralization is not institutionalized, it should be, so that appropriate levels of capacity and technical support can be provided to subject matter bureaus.
5. IT decentralization has profound implications for non-subject matter bureaus with IT support responsibility. Their roles, responsibilities, and authorities need to be carefully and continuously analyzed and adjusted to reflect the realities of BPS operations and culture, to assure that their contributions are effective and efficient.
6. To make genuine improvements in IT support, BPS management should consider IT issues as management, social and cultural issues, not technical issues. BPS has some internal IT technical resources, which can used more efficiently and effectively if they can be formally recognized and managed. In addition BPS can buy technology and computer capacity and hire or develop additional technicians. But unless the management, social and cultural issues are dealt with, BPS will not realize the full benefits of present and future investment in IT.
7. The greatest single problem confronting BPS IT is the acute and continuing shortage of competent IT technicians. There are several very competent professionals on staff, but they are overworked and spread too thinly to service the organization adequately.
8. With the advent of the Internet, support of data communications will become a growing part of overall IT capabilities and costs. In the USA it has become normal for

communications costs to be larger than IT infrastructure and technical support costs in data-intensive organizations.

9. Although BPS is a government agency, subject to government regulations and requirements, it has to operate as a business to survive and improve its operations and products.

10. But initiatives for new or improved services should be subject to rigorous cost-benefit analysis by management to assure that BPS gets the most effective use of its investments, and that the Indonesian government and economy get the most benefit from BPS activities and products.

SEASONAL ADJUSTMENT FOR LEBARAN

Report # 46

by
John Kuiper

February, 2002

Statistical Assistance to the Government of Indonesia (STAT) Project
USAID Contract No. PCE-I-00-99-00009-00

EXECUTIVE SUMMARY

An earlier project report introduced the seasonal adjustment framework and techniques incorporated in the widely used X12-ARIMA program and applied them to a number of Indonesian time series. Since then a substantial amount of work has been done within BPS in using that program to adjust for seasonality in various series. One important seasonality in Indonesia which is not explicitly addressed in the current version of the program is Lebaran (Idul Fitri). Direct measurement of the Lebaran effect would be highly useful for policy. Although predictable, occurrence of Lebaran is not fixed according to the gregorian calendar. Thus its effect shifts from one calendar year to another.

This report documents an attempt to measure the Lebaran effect in several data series. Series which portrayed a significant Lebaran effect and the magnitude of that effect are provided in the summary table below. The Lebaran effect on total manufacturing production, for example, is a decline of 12.7%; that on the number of passenger kilometers is an increase of 32.08%.

Lebaran Effect for Selected Series

	% adjustment
Manufacturing production:	
ISIC 3 - Total	-12.70
ISIC 31 - Food	-15.78
ISIC 32 - Textiles	-11.40
ISIC 33 - Wood	-13.50
Transportation:	
Number of passengers	+4.74
Number of passenger kilometers	+32.08
Electricity:	
Electricity - Industrial usage (kwh)	-5.74

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I. INTRODUCTION

An earlier project report[1] introduced the seasonal adjustment framework and techniques incorporated in the widely used X12-ARIMA program and applied them to a number of Indonesian time series. Since then a substantial amount of work has been done within BPS in using that program to adjust for seasonality in various series. One important seasonality in Indonesia which is not explicitly addressed in the current version of the program is Lebaran (Idul Fitri). Direct measurement of the Lebaran effect would be highly useful for policy. Although predictable, occurrence of Lebaran is not fixed according to the gregorian calendar. Thus its effect shifts from one calendar year to another.

This report is an attempt at isolating the Lebaran effect in the X12-ARIMA program. The main results, relevant to most users, were summarized in the executive summary. The remaining body of the report is meant as a documentation of the methodology and results. Therefore, the sections that follow are meant as a technical supplement to the work undertaken earlier. Readers interested in some conceptual background on seasonal adjustment or in operating the X12-ARIMA program should refer to the earlier report.

II. METHODOLOGY

The X12 program has built-in options to estimate the effect of events which are not part of the seasonal pattern in a time series, for example, the effect of trading days (referred to in the program as "td" and "td1coef") and of Easter. These two effects are estimated in the "x11regression" specification by regressing special built-in variables on the irregular component I_t, which is obtained from a preliminary seasonal adjustment run that does not take account of these events. However, X12 does not include pre-programmed regression factors for a phenomenon like Lebaran. Because for Indonesian time series the effect of Lebaran may be significant, for some consumption or price series for example, it is important to have its effect separately. This section reports on our attempt to measure that effect.

A. Lebaran Adjustment Factors

First, a number of adjustment factors need to be defined. The following ones were used:

"lag" type:	lag02, lag04, lag06, lag10 and lag14.
"combined" type:	comb01, comb03, comb05, comb07, comb09, comb11 and comb13.
"lead" type:	lead02, lead04 and lead06.

[1] John Kuiper, *Seasonal Adjustment of Indonesian Time Series*, STAT Project Report #11, August, 2000.

The “lag” factors assume that the effect of Lebaran occurs before Lebaran, while the “lead” factors assume that it occurs after Lebaran. For example, “lag14" assumes that the effect of Lebaran starts 14 days before Lebaran and ends the day before Lebaran. “Lead06" assumes that the effect starts the day after Lebaran and ends six days after Lebaran. The combined factors assume that the effect is symmetric, with for example “comb07" adjusting for the seven-day period starting 3 days before Lebaran and ending 3 days after Lebaran. One should note that, in calculating the adjustment factors for Lebaran, the reference period is the first day of the Idul Fitri holiday.

Depending on the type of time series, the effect of Lebaran may be present before and/or after the holiday. In manufacturing production, for example, output may be lower during the one- or two-week period before Lebaran because some factories may close then. In this case, a “lag” factor should be used. For series on passenger transportation, the effect may be in the days both before and after Lebaran. In this case, a “combined” factor should be used.

For monthly time series, the number of days during a month that the Lebaran effect is present is obtained by determining how many days in the month are affected. For example, in 1990 the first day of Idul Fitri fell on April 28. For the adjustment factor “comb13", the period affected by Lebaran begins six days before April 28 (i.e. April 22), and ends six days after April 28 (i.e. on May 4). There are thus nine days affected in April and four days in May. The rest of the year is not influenced by the Lebaran effect. The monthly series of the number of days affected by Lebaran for 1990 is thus:

[0, 0, 0, 9, 4, 0, 0, 0, 0, 0, 0, 0].

The adjustment factors should be in centered form because they are used as regressors to explain the irregular component from the first pass of seasonal adjustment. Centering is needed because the seasonal adjustment program forces the irregular component to have a mean of 0.0 for additive adjustment, and of 1.0 for multiplicative adjustment.

The probability that Idul Fitri falls during a particular month in a particular year equals the number of days in that month divided by the number of days in the corresponding lunar year (354) multiplied by the number of days that the Lebaran effect is assumed to be present. For “comb13", this is 13 days. The “comb13" adjustment factor for January is thus (31/354) x 13 = 1.138. Similarly, for February it is (28.25/354) x 13 = 1.037. The long-run factors to put the initial adjustment factors in centered form for a calendar year are:

[1.138, 1.037, 1.138, 1.102, 1.138, 1.102, 1.138, 1.138, 1.102, 1,138, 1.102, 1.138]

The centered adjustment factors for a particular year are then obtained by subtracting the long-run centering factors from the series of days affected by Lebaran for each year. Thus for 1990 the "comb13" adjustment factors are:

[-1.138, -1.037, -1.138, 7.898, 2.862, -1.102, -1.138, -1.138, -1.102, -1.138, -1.102, -1.138]

B. Preparing Instructions

Instructions start with the "X11regression" specification. In this section we will use the example of the passenger kilometer data series. The complete set of instructions is presented in Table 1. The first set of instructions includes the following:

```
x11regression      {user=Ramadan
                    file="d:\seas_adj\ramadan\comb13.prn"
                    format="datevalue"
                    usertype=holiday
                    critical=4.00
                    aictest=(user)
                    print=(none + xaictest)
```

These specify that user-supplied variables are to be used for regression modeling of the irregular component. The "user" command specifies the names of these variables. These names are used to label estimated coefficients in the X12 output. The "file" command names the file where the user-defined regression variables are located. The "usertype" command assigns a type to the user-defined variables, which, in the case of the Lebaran regressor, is "holiday". The "format" command uses the date-value format to read the values for the variables listed in the "user" command from the file named in the "file" command. The date-value format enters three values on each record: the year, the month and the observation in free format.

In this example, the adjustment factor "comb13" was used. If there is no a-priori information on the pattern to be selected, the appropriate factor may be determined by running the program repeatedly with a different Lebaran regressor entered on the "file" command. The "aictest" command tests if the user-specified regression variables should be included in the regression model on the basis of the AICC test results. This test uses Aikake's AIC corrected for the length of the series. The model with the smallest AICC is selected. If more than one type of regressor is specified, the AIC tests are performed in the following order: 1) Trading day variables; 2) Easter variables and 3) User-defined variables. If more than one user-defined variable is specified, the AICC test is performed on them as a group, thus either all user-defined variables are included or all are excluded. The default is not to perform the AICC test. Option "xaictest" for the "x11regression" print command outputs the results of the AICC test.

Table 1
Transportation - Passenger kilometers (millions)

Instructions for Program #2 – with Lebaran adjustment factor:

```
#       Spec to enter data
series  {title="td, ramadan, outliers(ao), critical=4.00"
            format="datevalue"
            span=(1993.1, 2000.12)              period=12
            decimals=2
            print=(none + header + specfile + a1)       }

#       Spec for seasonal adjustment:
x11         {mode=mult             # default
            seasonalma=msr
            sigmalim=(1.5, 2.5)    # default  (1.5, 2.5)
            savelog =(ids m1 m2 m3 m4 m5 m6 m7 m8 m9 m10 m11 q q2)
            save=(d11)
            print=(none + d10 + d11 + d16 + d18 + f2 + f3)      }

#       Optional spec to estimate calendar effects:
x11regression  { variables=td
            user=Ramadan                               # exclude for program #1
            file="d:\seas_adj\ramadan\comb13.prn"      # exclude for program #1
            format="datevalue"                         # exclude for program #1
            usertype=holiday                           # exclude for program #1
            critical=4.00
            aictest=(user,td)
            print=(none + xaictest)                                 }

#       Optional spec for automatic ARIMA model selection
automdl     {file="d:\x12a\x12a.mdl"
            method=best            # default is "first"
            fcstlim=20             #  default is 15
            qlim=5.0               # default is 5% (for the Box Ljung Q)
            identify=all           # default is "first"
            print=(none + header + autochoice)
            savelog=automodel                   }

#       Spec to transform the data for the ARIMA model
transform   {function=log          # default is "none"
            savelog=autotransform
            print=(none)                                }

#       Optional spec to include outliers in x11regression
outlier     {types=(ao)
            critical=(4.00)
            span=(1993.1, 2000.12)        # subset of data used
            method=addone
            print=(none + header)                                   }
```

C. Data Entry and Retrieval

Data may be entered using free format. This option does not allow for using identifiers. One option is to use the “datevalue” format; then data is entered with the year, sub-period of the year and the data value. The example below shows monthly data for the period January 1980 to June 1980.

```
1980   1   -1.13842
1980   2   -1.03743
1980   3   -1.13842
1980   4   -1.10169
1980   5   -1.13842
1980   6   -1.10169
```

The “datevalue” format allows data to be entered for a sub-period of the series on the data file. For example, the file might start in January 1980, but X12 could enter data starting at a later date using the “span” command. This format also simplifies record keeping in that observations are always stored with the period to which they apply.

In most cases, it is desired to process a time series after it has been successfully seasonally adjusted. This is accomplished by using the “save” command in the X11 spec. For example, when adjusting a series named “dat10" the command “save (d11)" will output the data from Table D11 to a file named “dat10.d11". This file has the following layout:

```
date        dat10.d11
------      -----------------------
199301      +0.149371974880370E+04
199302      +0.149374116471588E+04
199303      +0.153867588092530E+04
```

Using Excel, select this file with file type “All files”. The text import wizard then enters the data. Import should start at row 3 using type “delimited” (the default). This data is entered in a new Excel worksheet and displayed using scientific notation.

III. RESULTS

A. Summary

For the series which showed improvement in the quality of the seasonal adjustment after including the Lebaran effect, the calendar factors, printed in table D18 of the seasonal adjustment output are listed in Table 2. The percentage adjustment due to Lebaran equals the calendar factor less 100. Thus for factors less than 100 there will be a reduction, and for factors greater than 100 there will be an increase in the level of the series during the period where the Lebaran effect is active. The estimates of Table 2 were obtained using the comb13 factors.

Table 2
Lebaran Effect for Months where Full Effect Falls within the Month

	Lebaran Calendar factor	Lebaran % adjustment
Manufacturing production:		
ISIC 3 - Total	87.30	-12.70
ISIC 31 - Food	84.22	-15.78
ISIC 32 - Textiles	88.60	-11.40
ISIC 33 - Wood	86.50	-13.50
Transportation:		
Number of passengers	104.74	+4.74
Number of passenger kilometers	132.08	+32.08
Electricity:		
Electricity - Industrial usage (kwh)	94.26	-5.74

B. Transportation

Appendix B presents the complete output from seasonally adjusting a series of passenger kilometers with X12. In the X12 printout, table D11 lists the final seasonally adjusted data, table D10 the final seasonal factors and table D18 the combined calendar adjustment factors. Table D16 lists the combined adjustment factors, these combine the factors in tables D10 and D18. For December 1999, the final seasonal factor (D10) was 92.85 and the combined calendar adjustment factor was 96.92. The combined calendar adjustment factor (D16) is thus 100 x (.9285 x .9692) = 89.99. The unadjusted value (Table A1) for December 1999 is 1493.00 and the seasonally adjusted value (Table D11) is thus 1493.00 / .8999 = 1659.11.

Because the “xaictest” option is used in the x11regression command, the results of the AICC test are listed on page 2 of Appendix B. The trading day regressors were excluded, because the AICC value increases from -173.8 to -164.1, but comb13, the user-defined regressor was included because the AICC value decreased from -173.8 to -314.0.

Table 3 shows quality statistics for two seasonal adjustment runs on the time series of passenger kilometers . The first run does not include a correction for the effect of Lebaran, while the second run includes this correction. The first run has a quality measure Q of 1.222, which implies that seasonal adjustment was not acceptable (since Q exceeded 1). The second run has a quality measure Q of 0.716, therefore the seasonal adjustment using this program is acceptable.

Table 3 also shows the decomposition of the stationary portion of the variance into five components. This data is taken from X12 Table F2.F. Note that the contribution of the irregular component to the variance is 14.6% in run #1 and only 3.0% in run #2.

Figure 1 compares graphically the unadjusted and the seasonally adjusted series for the two adjustment runs. The first run does not include a correction for the effect of Lebaran, while the second run includes this correction.

Table 3
Transportation - Passenger kilometers (millions)

Results for X12 Program #1 – without Lebaran adjustment factor:
M-MLT dat22 -------- td, outliers(ao), critical 4.00

Default model used : none (no model selected)

Identifiable seasonality : yes

M01	:	1.694
M02	:	1.458
M03	:	1.487
M04	:	0.601
M05	:	2.100
M06	:	0.133
M07	:	1.041
M08	:	1.061
M09	:	1.046
M10	:	1.457
M11	:	1.457
Q	:	1.222
Q2	:	1.193

F 2.F: Relative contribution of the components to the stationary portion of the variance in the original series

I	C	S	P	TD&H	Total
14.58	22.14	54.90	0.00	0.00	91.62

Results for X12 Program #2 – with Lebaran adjustment factor:
M-MLT dat10 -------- td, ramadan, outliers(ao), critical 4.00

Automatic model chosen : (2 1 2)(0 1 1)

Identifiable seasonality : yes

M01	:	0.624
M02	:	0.302
M03	:	0.815
M04	:	0.126
M05	:	1.095
M06	:	0.464
M07	:	0.699
M08	:	0.981
M09	:	0.929
M10	:	1.292
M11	:	1.265
Q	:	0.716
Q2	:	0.767

F 2.F: Relative contribution of the components to the stationary portion of the variance in the original series

I	C	S	P	TD&H	Total
3.02	16.88	42.00	0.00	39.93	01.83

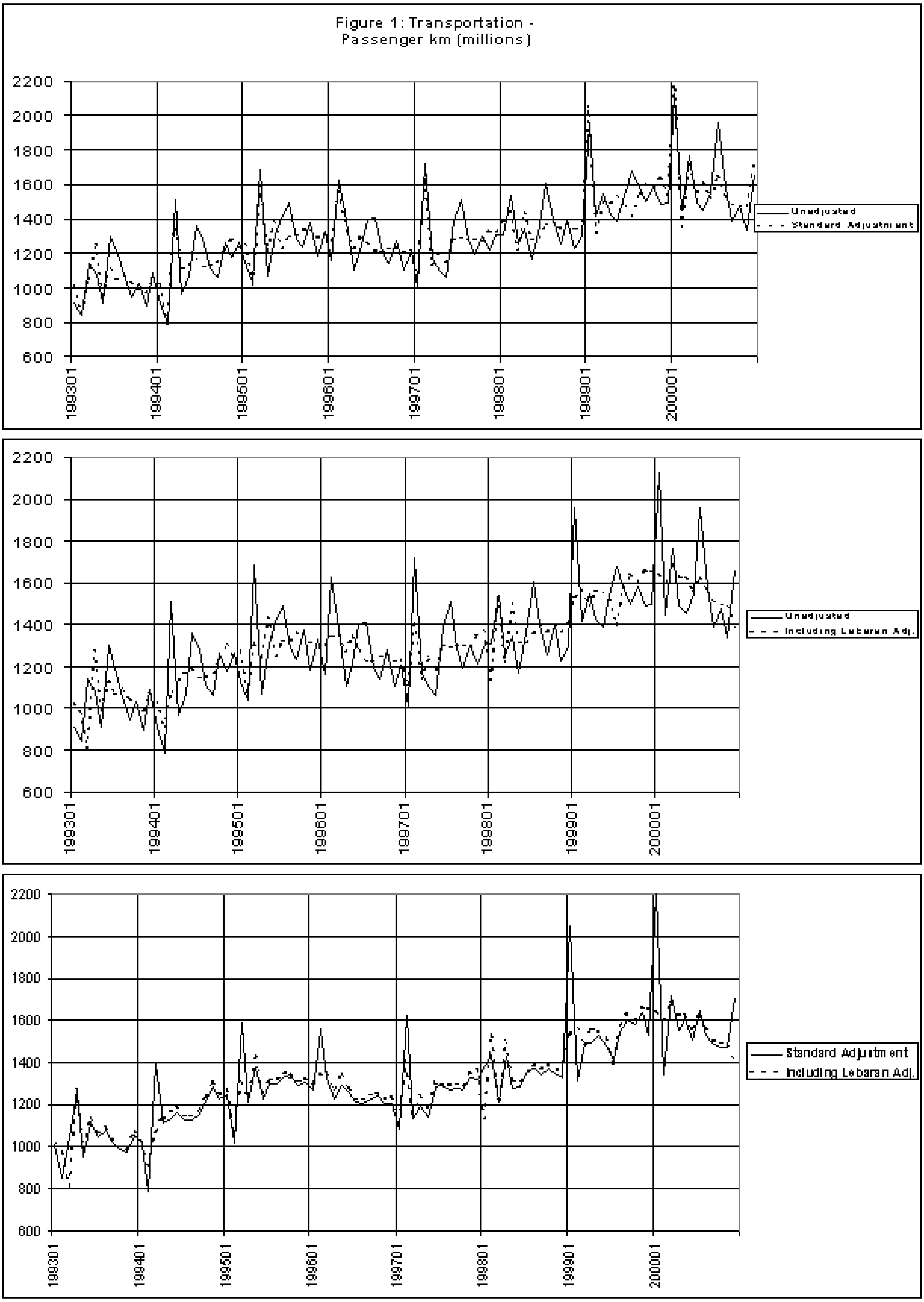


Figure 1: Transportation -
Passenger km (millions)
2200
2000
1800
1600
1400
1200
1000
800
600
199301
199401
199501
199601
199701
199801
199901
200001
Unadjusted
Standard Adjustment
Including Lebaran Adj.

C. Food Production

The same programs were also run on Manufacturing Food Production (ISIC 31). Appendix C shows the output for the second run, which includes the Lebaran adjustment, and Table 4 shows quality statistics for the two runs. The first run has a quality measure Q of 0.749, while the second run has a quality measure Q of 0.507. Thus, although both seasonal adjustment runs have acceptable results, the program which allows for the Lebaran effect is clearly better. Note the values of quality measure M5, which was reduced from 2.093 to 1.065. M5 is calculated from the "months for cyclical dominance" measure in Table F2.E. The MCD is 11 months for the run without Lebaran adjustment and 6 months for the run with Lebaran adjustment.

Table 4 also shows the quality measures from Table F2.F. Note that the contribution of the irregular component to the variance is 6.2% in run #1 and only 2.4% in run #2. Figure 2 compares graphically the unadjusted and the seasonally adjusted series for the two adjustment runs.

Table 4
Manufacturing Production - ISIC 31 (Food)

Results for X12 Program #1 – without Lebaran adjustment factor:
M-MLT dat22 -------- td, outliers(ao), critical 4.00

Default model used : none (no model selected)

Identifiable seasonality : yes

M01	:	0.862
M02	:	0.621
M03	:	1.371
M04	:	0.348
M05	:	2.093
M06	:	0.138
M07	:	0.402
M08	:	0.493
M09	:	0.409
M10	:	0.634
M11	:	0.618
Q	:	0.749
Q2	:	0.765

F 2.F: Relative contribution of the components to the stationary portion of the variance in the original series

I	C	S	P	TD&H	Total
6.21	40.23	55.33	0.00	0.00	01.76

Results for X12 Program #2 – with Lebaran adjustment factor:
MLT dat10 -------- td, ramadan, outliers(ao), critical 4.00

Default model used : (0 1 1)(0 1 1) (no model selected)

Identifiable seasonality : yes

M01	:	0.452
M02	:	0.245
M03	:	1.024
M04	:	0.221
M05	:	1.065
M06	:	0.060
M07	:	0.333
M08	:	0.444
M09	:	0.375
M10	:	0.580
M11	:	0.548
Q	:	0.478
Q2	:	0.507

F 2.F: Relative contribution of the components to the stationary portion of the variance in the original series

I	C	S	P	TD&H	Total
2.45	33.30	34.40	0.00	3.10	83.24

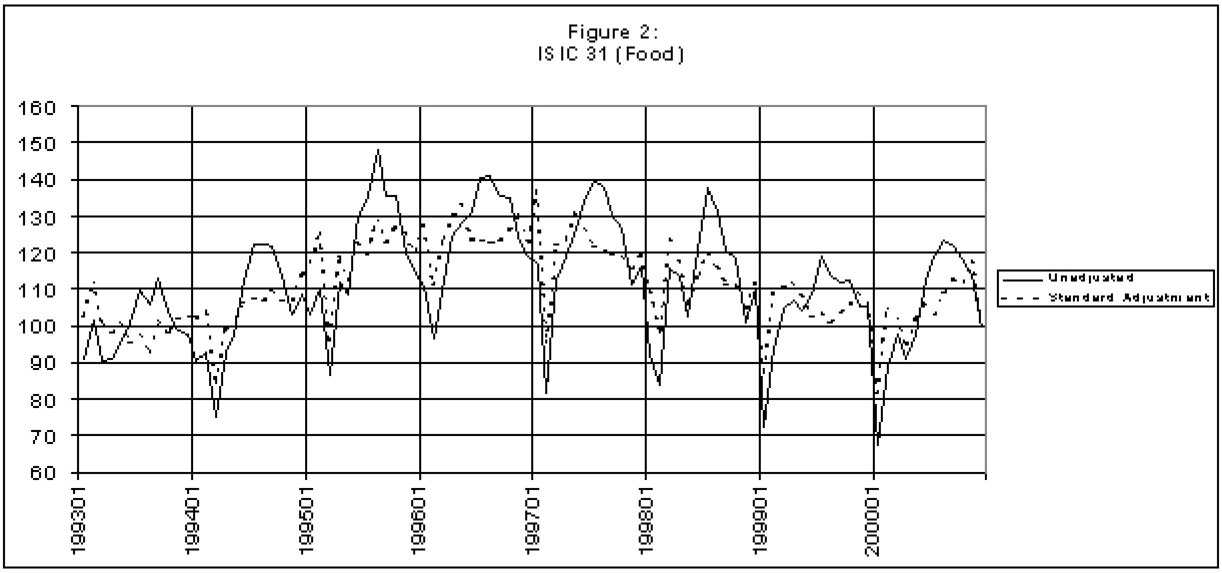
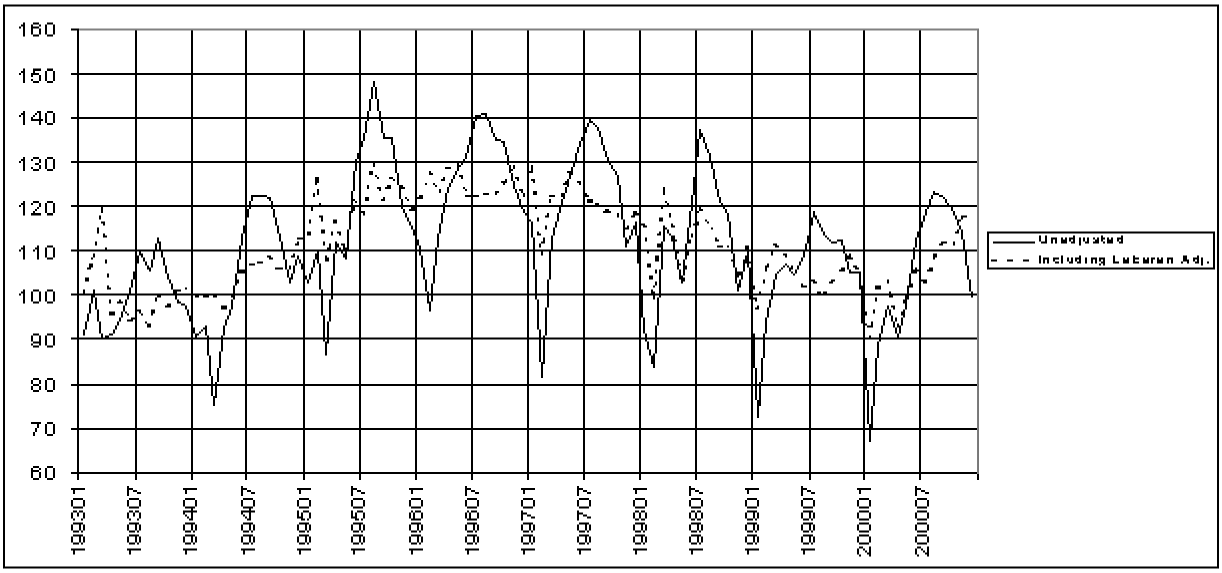
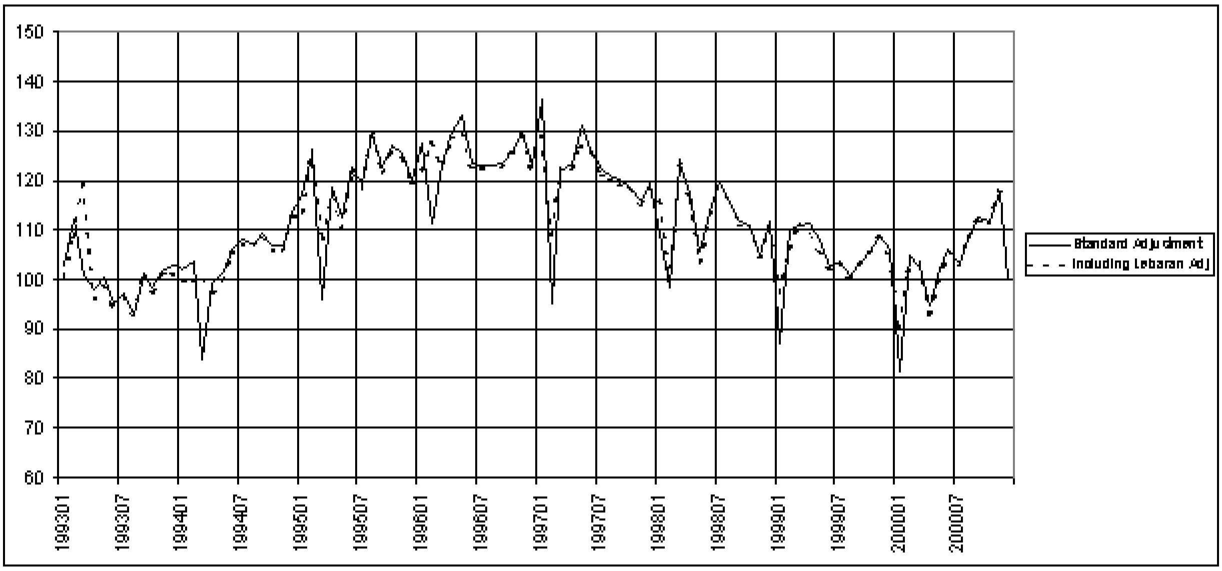


Figure 2:
ISIC 31 (Food)
160
150
140
130
120
110
100
90
80
70
60
199301
199401
199501
199601
199701
199801
199901
200001
Unadjusted
Standard Adjustment


160
150
140
130
120
110
100
90
80
70
60
199301
199307
199401
199407
199501
199507
199601
199607
199701
199707
199801
199807
199901
199907
200001
200007
Unadjusted
Including Lebaran Adj.



D. Other Series

Table 5 provides a summary of the series which were seasonally adjusted using the same methodology applied to the above two series. The series in the first part of the table were adjusted both without and with the Lebaran factors. Out of ten 2-digit ISIC series for manufacturing production, four showed improvement: ISIC 3 (Total), 31(Food), 32 (Textiles) and 33 (Wood). For transportation, the two passenger series improve, but the two freight series do not. Finally, the series of industrial usage of electricity improves when the Lebaran adjustment is included.

Table 6 presents the relative contribution of the components to the stationary portion of the variance in the original time series. These measures are taken from Table F2.F. This table shows that for the series which showed no improvement in Q after including the Lebaran adjustment, the contribution of the calendar factors was very small. This effect is listed in column TD&H which combines the trading day and holiday regressors.

Table 5
Series which were Seasonally Adjusted for Lebaran

Data Series	Measure of overall quality "Q"		Did seasonal adjustment improve?
	without Lebaran adjustment	with Lebaran adjustment	
Manufacturing production:			
ISIC 3 - Total	0.531	0.453	yes
ISIC 31 - Food	0.749	0.478	yes
ISIC 32 - Textiles	1.166	0.661	yes
ISIC 33 - Wood	1.123	0.872	yes
ISIC 34 - Paper	0.539	0.625	no
ISIC 35 - Chemicals	1.059	1.246	no
ISIC 36 - Non metallic minerals	0.445	0.572	no
ISIC 37 - Basic metals	0.711	0.776	no
ISIC 38 - Fabricated metal products	0.461	0.572	no
ISIC 39 - Other	0.995	0.942	no
Transportation:			
Freight - 000's of tons	0.769	0.844	no
Freight - millions of km tons	0.869	0.822	no
Passengers - thousands	0.860	0.661	yes
Passengers - millions of passenger km	1.222	0.716	yes
Electricity:			
Electricity - Industrial usage (kwh)	0.611	0.452	yes

Table 6
Decomposition of Variance for Series which were Seasonally Adjusted

a) without adjustment for Lebaran						
	I	**C**	**S**	**P**	**TD&H**	**Total**
Manufacturing production:						
ISIC 3 - Total	1.21	64.87	28.69	1.65	1.78	98.20
ISIC 31 - Food	6.21	40.23	55.33	0.00	0.00	101.76
ISIC 32 - Textiles	11.35	46.15	39.80	0.00	0.00	97.30
ISIC 33 - Wood	3.46	49.26	39.29	0.00	1.30	93.31
ISIC 34 - Paper	2.83	64.47	29.26	6.48	1.69	104.73
ISIC 35 - Chemicals	4.49	76.31	12.50	2.82	1.97	98.09
ISIC 36 - Non metallic minerals	1.07	72.27	20.59	11.43	0.73	106.10
ISIC 37 - Basic metals	6.38	56.95	29.39	5.81	0.00	98.53
ISIC 38 - Fabricated metal products	0.84	84.54	10.70	2.94	0.59	99.61
ISIC 39 - Other	7.32	79.55	19.13	0.00	0.00	106.10
Transportation:						
Freight - 000's of tons	9.55	33.70	51.17	0.00	0.00	94.42
Freight - millions of km tons	10.42	38.98	46.20	0.00	0.00	95.60
Passengers - thousands	5.18	69.09	19.11	0.00	0.00	93.39
Passengers - millions of passenger km	14.58	22.14	54.90	0.00	0.00	91.62
Other:						
Electricity - Industrial usage (kwh)	4.32	50.31	48.20	0.00	0.00	102.83
b) with adjustment for Lebaran						
	I	**C**	**S**	**P**	**TD&H**	**Total**
Manufacturing production:						
ISIC 3 - Total	1.49	54.66	14.19	1.73	14.54	86.62
ISIC 31 - Food	2.45	33.30	34.40	0.00	13.10	83.24
ISIC 32 - Textiles	4.68	32.04	16.79	22.03	34.69	110.23
ISIC 33 - Wood	3.59	40.83	17.81	0.00	17.67	79.89
ISIC 34 - Paper	3.62	60.78	23.12	6.47	2.97	96.96
ISIC 35 - Chemicals	4.72	62.39	6.61	0.00	16.61	90.34
ISIC 36 - Non metallic minerals	2.56	66.91	17.94	0.00	1.87	89.28
ISIC 37 - Basic metals	8.11	59.73	23.94	4.59	0.71	97.08
ISIC 38 - Fabricated metal products	0.44	81.67	6.12	0.00	4.46	92.69
ISIC 39 - Other	6.14	79.66	17.46	0.00	0.27	103.53
Transportation:						
Freight - 000's of tons	9.46	32.45	35.56	0.00	4.64	82.11
Freight - millions of km tons	8.02	39.96	34.15	0.00	3.17	85.30
Passengers - thousands	3.45	71.82	20.84	0.00	3.17	99.27
Passengers - millions of passenger km	3.02	16.88	42.00	0.00	39.93	101.83
Other:						
Electricity - Industrial usage (kwh)	1.84	46.79	21.78	9.81	12.98	93.19

Notes:
I = Irregular component
C = Trend cycle component
S = Seasonal component
P = a priori adjustment factor
TD&H = trading day & holiday factors

IV. QUALITY MEASURES

Table F2 presents quality measures of the seasonal adjustment. These measures are in many cases repeated from tables in part A to E of the X12 output. Some of the more important quality measures of Table F2 are discussed below. Several of these quality measures are standardized and entered in Table F3, where they are used to obtain the measure of overall quality "Q".

A. Contribution of Components to Changes

Table F2.B shows, for a given time lag, the relative contribution of each component to the variance of changes in the original series. The relative contribution of each component of the original series, I (the irregular), C (the trend-cycle), S (seasonality), P (a priori adjustment factors) and TD&H (factors for trading days and holidays) is shown. The last column (ratio x 100) shows the quality of the approximation. Statistic M1 measures the contribution of the irregular to total variance for a time lag of three months.

B. Average Duration of Run

This statistic is presented in Table F 2.D. It computes the average number of months (quarters) with consecutive changes in the same direction. It is calculated for tables D11 (the final adjusted series), D13 (the final irregular series), D12 (the final trend-cycle) and F1 (the smoothed final adjusted series using the MCD). The F tests which are carried out in X11 are valid if the irregulars are random. The ADR (average duration of run) is a measure of randomness. Statistic M4 of Table F3 is calculated from the ADR for the irregular component (Table D13).

C. I/C Ratio for Period

Table F2.E shows the ratios of the average changes in the final irregular component (Table D13) and the average changes in the final trend-cycle (Table D12) for a span of 12 months (4 quarters). The MCD (months for cyclical dominance) value is the first value for which I/C is less than 1.0. For a monthly series this value should not exceed 6 months. Statistic M5 of Table F3 is derived from the MCD.

D. Contribution of Components to Stationary Portion of Variance

These statistics are presented in Table F 2.F. The original series is made stationary by removing an exponential trend if a multiplicative model is used or a linear trend if the model is additive. The relative contribution of each component of the original series, I (the irregular), C (the trend-cycle), S (seasonality), P (a priori adjustment factors) and TD&H (factors for trading days and holidays) is calculated. If trading days and/or holidays (TD&H) are included in the X12 seasonal adjustment this table may be used to show their relative importance. The contribution of the irregular component is considered acceptable if it does not exceed 10%. Statistic M2 of Table F3 is calculated as 10 x contr(I) / (1-contr(P)).

E. I/C and I/S Ratios

Table F2.H presents the final I/C ratio from Table D12 and the final I/S ratio from Table D10. Statistic M3 is calculated from the I/C ratio and statistic M6 from the I/S ratio.

F. Testing Presence of Seasonality

Table F2.I repeats the values of the F-tests from Table B1 (stable seasonality) and Table D8A (stable seasonality, Kruskal-Wallis test for stable seasonality and the F-test for moving seasonality). Statistic M7 of Table F3 compares the amount of stable seasonality present relative to the amount of moving seasonality.

APPENDIX A
SEASONAL ADJUSTMENT OF COMPOSITE SERIES

This appendix is a response to several BPS enquiries about how best to seasonally adjust composite series. A composite series refers to a series that results from the addition, subtraction, multiplication or division of a number of component series.

I. INSTRUCTIONS FOR COMPONENT SERIES

To indicate that a time series is a component of an aggregate series, the "**comptype**" command is used in the *series* spec. The options allowed with this command are: add, sub, mult and div. Command "**compwt**" is used in the *series* spec of the component series to show the weight that the component has in forming the aggregate series. This weight must be greater than zero. The default for the component weight is one.

As an example, the instruction set for seasonally adjusting the component series of male employment of the composite series total employment is listed in Table A.1.

Table A.1

```
#       Spec to enter data for component series empl_m:
series          {title="employed - male"
                file="empl_m.prn"
                format="datevalue"
                span=(1993.1, 2000.12)
                period=12
                decimals=2
                comptype=add
                compwt=1.0
                print=(none + header)                   }

#       Spec for seasonal adjustment:
x11             {mode=mult
                savelog =(msr icr msf ids m1 m2 m3 m4 m5 m6 m7 m8 m9 m10 m11 q q2)
                save=(d11)
                print=(none + d8b + d10 + d11 + d12 + f2 + f3) }
```

II. INSTRUCTIONS FOR COMPOSITE SERIES

There are two ways to seasonally adjust a composite series, the direct and indirect methods. In the direct method, the composite series is constructed from the unadjusted component series and then seasonally adjusted. In the indirect method, each of the component series is seasonally adjusted first and then the adjusted series are combined by applying the arithmetic operations defined for them with commands "comptype" and "compwt".

The instruction set for the composite series starts with the *composite* specification. With this specification the print command gives output options for the indirect command only. Note that commands to enter time series are not used with the "composite" specification, because the composite time series is formed from the component series.

As an example, the instruction set for seasonally adjusting the composite series of total employment is listed in Table A.2.

Table A.2

```
#           Spec for seasonal adjustment of total employment - indirect method:
composite         {title="employed - total"
                  decimals=2
                  savelog=(indtest iid im1 im2 im3 im4 im5 im6 im7 iq iq2)
                  print=(brief + header + indtest)             }

#           Spec for seasonal adjustment of total employment - direct method:
x11               {mode=mult
                  savelog =(msr icr msf ids m1 m2 m3 m4 m5 m6 m7 m8 m9 m10 m11 q q2)
                  save=(d11)
                  print=(none + d10 + d11 + d12 + f2 + f3)          }
```

III. PREPARATION OF THE META FILE

The programs are processed from a meta file, with the program for the composite series as the last program listed. The extension used for meta files is mta. Thus the instructions for seasonally adjusting total employment listed in file prog.mta are:

File prog.mta:
```
empl_m
empl_f
empl_tot
```

To indicate that a meta file is to be processed the -m flag precedes the file name on the MS-DOS command. In this case the instruction is thus:

```
X12a -m  prog
```

IV. CHOOSING THE DIRECT VS INDIRECT METHOD

Option **indtest** of the print and savelog commands refers to a test that indicates if the direct or indirect seasonally adjusted series is to be preferred. The test measures the degree of roughness or in other words the lack of smoothness in a seasonally adjusted series.

Test statistic R_1 measures the sum of squares of the first differences of the series, i.e.

$$R_1 = \text{Sum } (X_t - X_{t-1})^2$$

To exclude the effect of cyclical movements of short duration, test statistic R_2 is calculated. This statistic uses the 13 term Henderson filter, i.e.

$$R_2 = \text{Sum } (X_t - HX_t)^2$$

The seasonal adjustment method with the lower mean square error is to be preferred. The percentage difference between the direct and indirect method is also printed. Positive percentage differences indicate that the indirect method results in a smoother series and thus is to be preferred. In cases where measures R_1 and R_2 give conflicting results measure R_2 is preferred. Table A.3 shows an example of the output for print option “indtest”.

Table A.3
Measures of Roughness R1 and R2 for Seasaonally Adjusted Series

	DIRECT		INDIRECT		% diff.	
	FULL SERIES	LAST 3 YEARS	FULL SERIES	LAST 3 YEARS	FULL SERIES	LAST 3 YEARS
R1-MEAN SQUARE ERROR	367.536	478.069	360.866	479.382	1.815%	-0.275%
R1-ROOT MEAN SQUARE ERROR	19.171	21.865	18.996	21.895	0.912%	-0.137%
R2-MEAN SQUARE ERROR	0.003	0.004	0.003	0.004	4.700%	0.553%
R2-ROOT MEAN SQUARE ERROR	0.054	0.062	0.053	0.062	2.378%	0.277%

POSITIVE PERCENTAGE CHANGES INDICATE THAT THE INDIRECT SEASONALLY ADJUSTED COMPOSITE IS SMOOTHER THAN THE DIRECT SEASONALLY ADJUSTED

APPENDIX B
PRINTOUT: SEASONAL ADJUSTMENT OF PASSENGER KM

```
 Reading input spec file from dat10.spc
 Reading data from trsp4.prn
 Reading data from d:\seas_adj\ramadan\comb13.prn

                 U. S. Department of Commerce, U. S. Census Bureau

                    X-12-ARIMA monthly seasonal adjustment Method,
                              Release Version 0.2.7

            This method modifies the X-11 variant of Census Method II
            by J. Shiskin A.H. Young and J.C. Musgrave of February, 1967.
           and the X-11-ARIMA program based on the methodological research
            developed by Estela Bee Dagum, Chief of the Seasonal Adjustment
             and Time Series Staff of Statistics Canada, September, 1979.

       Primary Programmers: Brian Monsell, Mark Otto

      Series Title- td, ramadan, outliers(ao), critical=4.00
      Series Name- dat10
      01/31/02     19:23:40.35

         -Period covered-  1st month,1993 to 12th month,2000
         -Type of run - multiplicative seasonal adjustment

         -Sigma limits for graduating extreme values are 1.5 and 2.5 .
         -3x3 moving average used in section 1 of each iteration,
          3x5 moving average in section 2 of iterations B and C,
          moving average for final seasonal factors chosen by Global MSR.
         -Trading day and holiday irregular regression computed starting 1993.Jan
          with AO outliers identified using a critical value of  4.00.
         -Trading day irregular regression estimates applied.
         -Holiday irregular regression estimates applied.
         -Trading day and holiday irregular regression applied as prior factors.
         -Irregular regression AIC test performed for trading day,user-defined
regressors.
         -Holiday adjustment factors applied directly to the final seasonally
adjusted
          series
         -Spectral estimates of original series, table D11 and table E3 will be
searched
          for significant seasonal and trading day peaks
         -Printout suppressed.  Only user-specified tables and plots will be printed
out.

    Tables labeled "First pass" are from an initial seasonal adjustment used to
estimate
    irregular regression and/or X-11 Easter effects.
```

```
   td, ramadan, outliers(ao), critical=4.00          PAGE   1, SERIES dat10

 Contents of spc file dat10.spc

Line #
------
 #  Spec to enter data
 series   {title="td, ramadan, outliers(ao), critical=4.00"
           file="q31.prn"
           format="datevalue"
           span=(1993.1, 2000.12)
           period=12
           decimals=2
           # a1  - Original time series data (for the span analyzed)
           print=(none + header + specfile + a1)          }
 #  Spec for seasonal adjustment:
 x11            {mode=mult               # default
           seasonalma=msr
           sigmalim=(1.5, 2.5)     # default  (1.5, 2.5)
           # d11 - final seasonally adjusted series
           # d18 - combined calendar factors (td + holiday)
           savelog =(ids m1 m2 m3 m4 m5 m6 m7 m8 m9 m10 m11 q q2)
           save=(d11)
           print=(none + d10 + d11 + d16 + d18 + f2 + f3)  }
 #  Optional spec to estimate calendar effects:
 x11regression    { variables=td
           user=ramadan
           file="d:\seas_adj\ramadan\comb13.prn"
           format="datevalue"
           usertype=holiday
           critical=4.00
           aictest=(user,td)
           print=(none + xaictest)                          }
 #  Optional spec for automatic ARIMA model selection
 automdl  {file="d:\x12a\x12a.mdl"
           method=best                  #  default is "first"
           fcstlim=20                   #  default is 15
           overdiff=0.90                #  default  is 0.90
           qlim=5.0                     #  default is 5% (for the Box Ljung Q)
           identify=all                 #  default is "first"
           savelog=automodel
           print=(none + header + autochoice)               }
 #  Spec to transform the data for the ARIMA model
 transform      {function=log               # default is "none"
           savelog=autotransform
           print=(none)                                     }
 #  Optional spec to include outliers in x11regression
 outlier  {types=(ao)
           critical=(4.00)
           span=(1993.1, 2000.12)
           method=addone
           print=(none + header)                            }
```

```
      td, ramadan, outliers(ao), critical=4.00          PAGE   2, SERIES dat10

 A 1  Time series data (for the span analyzed)
  From  1993.Jan to 2000.Dec
  Observations         96
 -----------------------------------------------------------------------------
             Jan      Feb      Mar      Apr      May      Jun
             Jul      Aug      Sep      Oct      Nov      Dec          TOTAL
 -----------------------------------------------------------------------------
  1993      91.31   101.25    90.32    91.18    95.73   101.13
           109.99   105.84   112.92   104.28    98.43    97.62        1200.00

  1994      90.59    92.76    75.42    92.70    97.59   112.70
           122.23   122.10   121.75   113.45   102.95   108.55        1252.79

  1995     103.03   110.37    86.65   111.91   108.40   130.07
           135.68   148.20   135.28   135.32   120.27   115.44        1440.62

  1996     110.68    96.50   112.61   124.22   128.53   131.09
           140.45   140.80   135.17   134.58   124.62   118.87        1498.12

  1997     116.57    81.57   112.68   119.05   126.73   133.80
           139.65   137.80   130.36   126.75   111.18   116.43        1452.57

  1998      92.07    83.69   115.51   113.38   102.65   120.64
           137.46   131.30   120.95   118.29   101.12   110.08        1347.14

  1999      72.44    93.66   104.65   106.85   104.48   108.54
           118.90   113.66   112.03   112.26   105.35   105.32        1258.14

  2000      67.17    89.14    97.59    90.80    97.79   112.45
           118.83   123.36   121.91   118.63   114.07    99.27        1251.01

  AVGE      92.98    93.62    99.43   106.26   107.74   118.80
           127.90   127.88   123.80   120.44   109.75   108.95

  Table Total-     10700.39   Mean-     111.46   Std. Dev.-      16.41
                              Min -      67.17        Max -     148.20

AICC for model without td                                   -263.0550
AICC for model with td                                      -257.1900

 *****   AICC (with aicdiff= 0.00) prefers model without td    *****

 AICC for model without user-defined regressors             -263.0550
 AICC for model with user-defined regressor(s)              -363.4101

 *****   AICC (with aicdiff= 0.00) prefers model with user-defined regressor(s)
 Reading model file for automatic model selection from d:\x12a\x12a.mdl
     Autoregressive Integrated Moving Average (ARIMA) extrapolation program

     Model selected: Model with lowest average forecast error that meets
                     acceptance criteria.
 Transformation
  Log(y)

 OUTLIER DETECTION
  From  1993.Jan to 2000.Dec
  Observations         96
  Types           AO only
  Method            add one
  Critical |t| for AO outliers          4.00

 regARIMA Model Span:  From  1993.Jan to 2000.Dec

               None of the models were chosen.
               A default model specified by the user, (0 1 1)(0 1 1),
               will be used to generate regARIMA preadjustment factors
```

td, ramadan, outliers(ao), critical=4.00 PAGE 3, SERIES dat10

D 10 Final seasonal factors
From 1993.Jan to 2000.Dec
Observations 96
Seasonal filter 3 x 5 moving average

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
1993	89.53	92.14	90.00	93.93	95.72	105.66	
	112.77	112.35	111.28	105.68	96.05	94.85	100.00
1994	89.55	91.85	89.86	94.17	96.36	105.68	
	112.71	112.35	110.85	105.70	95.95	94.97	100.00
1995	89.54	91.20	89.78	94.60	97.13	105.73	
	112.95	112.69	109.83	105.75	95.40	95.34	99.99
1996	89.52	90.16	90.20	95.35	97.80	105.58	
	113.18	112.72	108.66	105.93	95.17	96.01	100.02
1997	89.19	89.02	90.97	96.09	98.16	105.31	
	113.42	112.60	107.70	105.77	95.21	96.98	100.03
1998	88.96	87.90	91.98	96.55	98.13	105.07	
	113.49	112.10	107.29	105.50	95.52	98.16	100.06
1999	88.68	87.09	92.80	96.59	97.64	105.01	
	113.71	111.87	107.25	105.06	95.55	99.21	100.04
2000	88.55	86.63	93.31	96.59	97.12	104.94	
	113.93	111.81	107.23	104.98	95.52	99.71	100.03
AVGE	89.19	89.50	91.11	95.48	97.26	105.37	
	113.27	112.31	108.76	105.55	95.55	96.90	

Table Total- 9602.02 Mean- 100.02 Std. Dev.- 8.37
Min - 86.63 Max - 113.93

D 10.A Final seasonal component forecasts
From 2001.Jan to 2001.Dec
Observations 12

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
2001	88.49	86.40	93.56	96.59	96.86	104.91	
	114.04	111.78	107.22	104.95	95.51	99.97	100.02

td, ramadan, outliers(ao), critical=4.00 PAGE 4, SERIES dat10

D 11 Final seasonally adjusted data
(also adjusted for trading day, holiday)
From 1993.Jan to 2000.Dec
Observations 96

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	TOTAL
1993	100.47	108.39	119.16	95.67	98.52	94.33	
	96.08	92.80	100.01	97.20	100.99	101.39	1205.01
1994	99.65	99.62	99.66	97.02	99.76	105.11	
	106.82	107.06	108.25	105.73	105.75	112.60	1247.03
1995	113.35	125.99	107.80	116.59	109.94	121.24	
	118.33	129.55	121.39	126.05	124.25	119.28	1433.76
1996	121.79	127.30	122.98	128.40	129.46	122.37	
	122.25	123.04	122.59	125.15	129.05	121.96	1496.35
1997	128.75	108.99	122.02	122.10	127.18	125.22	
	121.29	120.55	119.29	118.04	115.09	118.26	1446.79
1998	115.58	99.12	123.71	115.73	103.04	113.16	
	119.31	115.38	111.10	110.45	104.33	110.47	1341.38
1999	97.00	106.08	111.08	109.02	105.41	101.87	
	103.00	100.08	102.95	105.26	108.66	104.57	1254.99
2000	90.07	101.50	103.03	92.65	99.19	105.61	
	102.75	108.68	112.05	111.31	117.69	118.22	1262.73
AVGE	108.33	109.62	113.68	109.65	109.06	111.11	
	111.23	112.14	112.20	112.40	113.23	113.34	

Table Total- 10688.05 Mean- 111.33 Std. Dev.- 10.38
Min - 90.07 Max - 129.55

td, ramadan, outliers(ao), critical=4.00 PAGE 5, SERIES dat10

D 16 Combined adjustment factors
(includes seasonal, trading day, holiday factors)
From 1993.Jan to 2000.Dec
Observations 96

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
1993	90.88 114.48	93.41 114.05	75.80 112.91	95.30 107.28	97.17 97.46	107.21 96.28	100.19
1994	90.90 114.42	93.12 114.05	75.68 112.47	95.55 107.30	97.82 97.35	107.22 96.40	100.19
1995	90.90 114.66	87.60 114.39	80.38 111.44	95.98 107.35	98.60 96.80	107.28 96.78	100.18
1996	90.88 114.89	75.80 114.43	91.57 110.26	96.74 107.53	99.28 96.57	107.13 97.47	100.21
1997	90.54 115.14	74.84 114.31	92.35 109.28	97.50 107.38	99.64 96.60	106.85 98.45	100.24
1998	79.66 115.21	84.43 113.80	93.37 108.87	97.97 107.10	99.62 96.92	106.61 99.64	100.27
1999	74.68 115.43	88.29 113.57	94.21 108.82	98.01 106.65	99.12 96.95	106.55 100.71	100.25
2000	74.58 115.66	87.82 113.50	94.72 108.80	98.01 106.58	98.59 96.92	106.48 83.97	98.80
AVGE	85.38 114.99	85.67 114.01	87.26 110.36	96.88 107.15	98.73 96.95	106.92 96.21	

Table Total- 9603.98 Mean- 100.04 Std. Dev.- 10.91
Min - 74.58 Max - 115.66

D 16.A Combined adjustment component forecasts
From 2001.Jan to 2001.Dec
Observations 12

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
2001	89.83 115.77	87.59 113.47	94.98 108.79	98.01 106.54	98.33 96.91	106.44 84.19	100.07

td, ramadan, outliers(ao), critical=4.00 PAGE 6, SERIES dat10

D 18 Combined calendar adjustment factors
(includes trading day, holiday factors)
From 1993.Jan to 2000.Dec
Observations 96

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
1993	101.51 101.51	101.38 101.51	84.22 101.47	101.47 101.51	101.51 101.47	101.47 101.51	100.05
1994	101.51 101.51	101.38 101.51	84.22 101.47	101.47 101.51	101.51 101.47	101.47 101.51	100.05
1995	101.51 101.51	96.06 101.51	89.54 101.47	101.47 101.51	101.51 101.47	101.47 101.51	100.05
1996	101.51 101.51	84.08 101.51	101.51 101.47	101.47 101.51	101.51 101.47	101.47 101.51	100.05
1997	101.51 101.51	84.08 101.51	101.51 101.47	101.47 101.51	101.51 101.47	101.47 101.51	100.05
1998	89.54 101.51	96.06 101.51	101.51 101.47	101.47 101.51	101.51 101.47	101.47 101.51	100.05
1999	84.22 101.51	101.38 101.51	101.51 101.47	101.47 101.51	101.51 101.47	101.47 101.51	100.05
2000	84.22 101.51	101.38 101.51	101.51 101.47	101.47 101.51	101.51 101.47	101.47 84.22	98.60
AVGE	95.69 101.51	95.72 101.51	95.69 101.47	101.47 101.51	101.51 101.47	101.47 99.35	

Table Total- 9587.10 Mean- 99.87 Std. Dev.- 4.78
Min - 84.08 Max - 101.51

D 18.A Combined calendar adjustment component forecasts
From 2001.Jan to 2001.Dec
Observations 12

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
2001	101.51 101.51	101.38 101.51	101.51 101.47	101.47 101.51	101.51 101.47	101.47 84.22	100.05

td, ramadan, outliers(ao), critical=4.00 PAGE 7, SERIES dat10

F 2. Summary Measures

F 2.A: Average percent change without regard to sign over the indicated span

Span in months	B1 O	D11 CI	D13 I	D12 C	D10 S	A2 P	D18 TD&H	F1 mcd
1	9.23	4.88	4.70	0.94	4.44	0.00	3.12	0.86
2	12.39	5.25	4.47	1.81	7.83	0.00	3.37	1.59
3	15.04	5.28	4.01	2.57	10.81	0.00	3.23	2.19
4	17.36	5.93	4.32	3.21	12.56	0.00	3.27	2.71
5	19.57	6.48	4.54	3.75	14.32	0.00	3.29	3.22
6	19.60	6.02	3.98	4.17	14.34	0.00	3.35	3.71
7	19.70	6.56	4.22	4.54	14.04	0.00	3.36	4.20
8	18.50	6.57	4.08	4.93	12.47	0.00	3.42	4.71
9	16.15	6.75	4.13	5.38	10.74	0.00	3.45	5.26
10	14.14	7.97	4.62	5.91	7.71	0.00	3.49	5.81
11	11.11	8.03	4.22	6.49	4.38	0.00	2.25	6.36
12	8.49	8.09	3.70	7.09	0.38	0.00	1.10	6.93

Span in months	E1 Mod.O	E2 Mod.CI	E3 Mod.I
1	7.82	2.97	2.68
2	11.32	3.48	2.57
3	14.15	3.94	2.52
4	16.50	4.62	2.56
5	18.35	5.19	2.65
6	18.71	4.94	2.23
7	18.58	5.46	2.32
8	17.32	5.65	2.24
9	14.86	5.88	2.34
10	12.75	6.61	2.50
11	10.06	7.11	2.36
12	7.75	7.66	2.33

F 2.B: Relative contributions to the variance of the percent change in the components of the original series

Span in months	E3 I	D12 C	D10 S	A2 P	D18 TD&H	TOTAL	RATIO (X100)
1	19.14	2.34	52.56	0.00	25.97	100.00	61.25
2	8.00	3.96	74.25	0.00	13.79	100.00	64.42
3	4.52	4.71	83.33	0.00	7.44	100.00	70.07
4	3.53	5.57	85.12	0.00	5.78	100.00	68.06
5	2.96	5.93	86.54	0.00	4.57	100.00	70.33
6	2.08	7.28	85.94	0.00	4.70	100.00	68.33
7	2.30	8.80	84.08	0.00	4.82	100.00	67.89
8	2.56	12.35	79.14	0.00	5.95	100.00	65.54
9	3.39	17.91	71.33	0.00	7.37	100.00	73.27
10	5.53	30.97	52.73	0.00	10.77	100.00	69.33
11	7.75	58.54	26.70	0.00	7.02	100.00	71.14
12	9.55	88.09	0.26	0.00	2.10	100.00	94.98

F 2.C: Average percent change with regard to sign and standard deviation over indicated span

Span in months	B1 O Avg.	B1 O S.D.	D13 I Avg.	D13 I S.D.	D12 C Avg.	D12 C S.D.
1	0.92	12.87	0.31	6.54	0.08	1.16
2	1.48	16.27	0.31	6.51	0.19	2.26
3	2.29	19.23	0.11	5.76	0.30	3.23
4	3.14	21.93	0.19	5.80	0.42	4.05
5	3.98	24.87	0.24	6.37	0.55	4.70
6	4.38	25.54	0.19	5.56	0.67	5.20
7	4.21	24.62	0.23	5.82	0.78	5.62
8	3.75	22.91	0.24	5.79	0.88	6.02

9	5.94	19.21	0.35	8.38	4.42	7.30
10	7.42	23.39	0.39	8.06	5.06	7.77
11	7.43	19.92	0.39	7.79	5.74	8.19
12	7.27	13.40	0.26	7.07	6.43	8.56

Span in months	D10 S Avg.	S.D.	D11 CI Avg.	S.D.	F1 mcd Avg.	S.D.
1	0.70	12.01	0.85	10.81	0.44	1.15
2	1.05	14.55	1.10	8.28	0.91	2.10
3	0.76	12.85	1.94	10.33	1.37	2.90
4	0.90	12.86	2.04	9.05	1.88	3.64
5	1.14	14.21	2.64	9.76	2.44	4.35
6	1.21	14.06	3.09	9.87	3.03	4.98
7	0.92	12.62	3.61	10.45	3.65	5.49
8	0.85	13.12	4.13	10.64	4.31	5.91
9	0.73	11.64	4.77	11.37	5.01	6.29
10	1.00	13.61	5.45	11.28	5.72	6.66
11	0.80	12.09	6.13	11.67	6.40	7.04
12	0.00	1.17	6.68	11.19	7.06	7.42

F 2.D: Average duration of run

CI	I	C	mcd
1.56	1.46	9.50	4.94

F 2.E: I/C Ratio for months span

SPAN	1	2	3	4	5	6
I/C	6.09	2.59	2.04	1.38	1.20	1.00

SPAN	7	8	9	10	11	12
I/C	0.94	0.81	0.77	0.67	0.60	0.53

months for cyclical dominance: 6

F 2.F: Relative contribution of the components to the stationary portion of the variance in the original series

I	C	S	P	TD&H	Total
3.02	16.88	42.00	0.00	39.93	101.83

F 2.G: The autocorrelation of the irregulars for spans 1 to 14

SPAN	1	2	3	4	5	6	7
ACF	-0.45	0.16	-0.22	0.08	0.00	0.02	-0.05

SPAN	8	9	10	11	12	13	14
ACF	0.02	-0.04	-0.03	0.00	0.27	-0.18	0.15

F 2.H: The final I/C Ratio from Table D12: 2.63
The final I/S Ratio from Table D10: 2.84

F 2.I:

		Statistic	Prob. level
F-test for stable seasonality from Table B 1.	:	11.782	0.00%
F-test for stable seasonality from Table D 8.	:	12.049	0.00%
Kruskal-Wallis Chi Squared test for stable seasonality from Table D 8.	:	54.112	0.00%
F-test for moving seasonality from Table D 8.	:	1.592	15.04%

```
    td, ramadan, outliers(ao), critical=4.00          PAGE   9, SERIES dat10

F 3. Monitoring and Quality Assessment Statistics
     All the measures below are in the range from 0 to 3 with an
     acceptance region from 0 to 1.

  1. The relative contribution of the irregular over three       M1  = 0.452
     months span (from Table F 2.B).

  2. The relative contribution of the irregular component        M2  = 0.245
     to the stationary portion of the variance (from Table
     F 2.F).

  3. The amount of month to month change in the irregular        M3  = 1.024
     component as compared to the amount of month to month
     change in the trend-cycle (from Table F2.H).

  4. The amount of autocorrelation in the irregular as           M4  = 0.221
     described by the average duration of run (Table F 2.D).

  5. The number of months it takes the change in the trend-      M5  = 1.065
     cycle to surpass the amount of change in the irregular
     (from Table F 2.E).

  6. The amount of year to year change in the irregular as       M6  = 0.060
     compared to the amount of year to year change in the
     seasonal (from Table F 2.H).

  7. The amount of moving seasonality present relative to        M7  = 0.333
     the amount of stable seasonality (from Table F 2.I).

  8. The size of the fluctuations in the seasonal component      M8  = 0.444
     throughout the whole series.

  9. The average linear movement in the seasonal component       M9  = 0.375
     throughout the whole series.

 10. Same as 8, calculated for recent years only.                M10 = 0.580

 11. Same as 9, calculated for recent years only.                M11 = 0.548

       *** ACCEPTED *** at the level   0.48

       *** Check the  2 above measures which failed.

       *** Q (without M2) =  0.51  ACCEPTED.
```

APPENDIX C

PRINTOUT: SEASONAL ADJUSTMENT OF ISIC 31 - FOOD

```
 Reading input spec file from dat10.spc
 Reading data from q31.prn
 Reading data from d:\seas_adj\ramadan\comb13.prn

               U. S. Department of Commerce, U. S. Census Bureau

                 X-12-ARIMA monthly seasonal adjustment Method,
                          Release Version 0.2.7


           This method modifies the X-11 variant of Census Method II
           by J. Shiskin A.H. Young and J.C. Musgrave of February, 1967.
          and the X-11-ARIMA program based on the methodological research
           developed by Estela Bee Dagum, Chief of the Seasonal Adjustment
            and Time Series Staff of Statistics Canada, September, 1979.

       Primary Programmers: Brian Monsell, Mark Otto


      Series Title- td, ramadan, outliers(ao), critical=4.00
      Series Name- dat10
      01/31/02    19:37:42.69

         -Period covered-  1st month,1993 to 12th month,2000
         -Type of run - multiplicative seasonal adjustment

         -Sigma limits for graduating extreme values are 1.5 and 2.5 .
         -3x3 moving average used in section 1 of each iteration,
          3x5 moving average in section 2 of iterations B and C,
          moving average for final seasonal factors chosen by Global MSR.
         -Trading day and holiday irregular regression computed starting 1993.Jan
          with AO outliers identified using a critical value of  4.00.
         -Trading day irregular regression estimates applied.
         -Holiday irregular regression estimates applied.
         -Trading day and holiday irregular regression applied as prior factors.
         -Irregular regression AIC test performed for trading day,user-defined
regressors.
         -Holiday adjustment factors applied directly to the final seasonally
adjusted
          series
         -Spectral estimates of original series, table D11 and table E3 will be
searched
          for signficant seasonal and trading day peaks
         -Printout suppressed.  Only user-specified tables and plots will be printed
out.

    Tables labeled "First pass" are from an initial seasonal adjustment used to
estimate
    irregular regression and/or X-11 Easter effects.
```

```
  td, ramadan, outliers(ao), critical=4.00          PAGE   1, SERIES dat10

 Contents of spc file dat10.spc

Line #
------
# Spec to enter data
series   {title="td, ramadan, outliers(ao), critical=4.00"
          file="trsp4.prn"
          format="datevalue"
          span=(1993.1, 2000.12)
          period=12
          decimals=2
          # a1  - Original time series data (for the span analyzed)
          print=(none + header + specfile + a1)          }

# Spec for seasonal adjustment:
x11             {mode=mult              # default
          seasonalma=msr
          sigmalim=(1.5, 2.5)      # default  (1.5, 2.5)
          # d11 - final seasonally adjusted series
          # d18 - combined calendar factors (td + holiday)
          savelog =(ids m1 m2 m3 m4 m5 m6 m7 m8 m9 m10 m11 q q2)
          save=(d11)
          print=(none + d10 + d11 + d16 + d18 + f2 + f3)  }

# Optional spec to estimate calendar effects:
x11regression   { variables=td
          user=ramadan
          file="d:\seas_adj\ramadan\comb13.prn"
          format="datevalue"
          usertype=holiday
          critical=4.00
          aictest=(user,td)
          print=(none + xaictest)                          }

# Optional spec for automatic ARIMA model selection
automdl  {file="d:\x12a\x12a.mdl"
          method=best                 #  default is "first"
          fcstlim=20                  #  default is 15
          overdiff=0.90               #  default  is 0.90
          qlim=5.0                    #  default is.5% (for the Box Ljung Q)
          identify=all                #  default is "first"
          savelog=automodel
          print=(none + header + autochoice)               }

# Spec to transform the data for the ARIMA model
transform       {function=log              # default is "none"
          savelog=autotransform
          print=(none)                                     }

# Optional spec to include outliers in x11regression
outlier  {types=(ao)
          critical=(4.00)
          span=(1993.1, 2000.12)
          method=addone
          print=(none + header)                            }
```

```
      td, ramadan, outliers(ao), critical=4.00          PAGE   2, SERIES dat10

 A 1  Time series data (for the span analyzed)
  From  1993.Jan to 2000.Dec
  Observations         96
 ---------------------------------------------------------------------------
                Jan      Feb      Mar      Apr      May      Jun
                Jul      Aug      Sep      Oct      Nov      Dec       TOTAL
 ---------------------------------------------------------------------------
  1993       906.00   843.00  1139.00  1082.00   906.00  1300.00
            1189.00  1054.00   948.00  1029.00   891.00  1089.00    12376.00

  1994       911.00   785.00  1507.00   965.00  1068.00  1356.00
            1281.00  1112.00  1062.00  1262.00  1176.00  1265.00    13750.00

  1995      1125.00  1036.00  1684.00  1068.00  1305.00  1405.00
            1491.00  1285.00  1238.00  1374.00  1186.00  1327.00    15524.00

  1996      1160.00  1621.00  1383.00  1104.00  1212.00  1400.00
            1405.00  1202.00  1142.00  1276.00  1108.00  1207.00    15220.00

  1997      1007.00  1721.00  1167.00  1093.00  1064.00  1386.00
            1507.00  1284.00  1193.00  1299.00  1214.00  1302.00    15237.00

  1998      1304.00  1536.00  1253.00  1344.00  1171.00  1356.00
            1606.00  1399.00  1257.00  1391.00  1224.00  1299.00    16140.00

  1999      1959.00  1412.00  1544.00  1422.00  1386.00  1535.00
            1676.00  1586.00  1498.00  1586.00  1488.00  1493.00    18585.00

  2000      2125.00  1446.00  1765.00  1492.00  1453.00  1549.00
            1962.00  1579.00  1385.00  1476.00  1336.00  1660.00    19228.00

  AVGE      1312.13  1300.00  1430.25  1196.25  1195.63  1410.88
            1514.63  1312.63  1215.38  1336.63  1202.88  1330.25

  Table Total-    126060.00   Mean-     1313.13   Std. Dev.-     246.24
                              Min -      785.00        Max -    2125.00

AICC for model without td                                   -173.8446
AICC for model with td                                      -164.1110

   *****   AICC (with aicdiff= 0.00) prefers model without td   *****

 AICC for model without user-defined regressors             -173.8446
 AICC for model with user-defined regressor(s)              -313.9677

   *****   AICC (with aicdiff= 0.00) prefers model with user-defined regressor(s)
 Reading model file for automatic model selection from d:\x12a\x12a.mdl
     Autoregressive Integrated Moving Average (ARIMA) extrapolation program
     ARIMA extrapolation model (forecast)

     Model selected: Model with lowest average forecast error that meets
                     acceptance criteria.
 Transformation
  Log(y)

 OUTLIER DETECTION
  From  1993.Jan to 2000.Dec
  Observations         96
  Types            AO only
  Method             add one
  Critical |t| for AO outliers          4.00

 regARIMA Model Span:  From  1993.Jan to 2000.Dec

                The model chosen is (2 1 2)(0 1 1)
```

t6, ramadan, outliers(ao), critical=4.00 PAGE 3, SERIES dat10

D 10 Final seasonal factors
From 1993.Jan to 2000.Dec
Observations 96
Seasonal filter 3 x 5 moving average

	Jan / Jul	Feb / Aug	Mar / Sep	Apr / Oct	May / Nov	Jun / Dec	AVGE
1993	91.45	88.70	106.92	87.64	94.66	118.51	
	115.12	99.85	93.73	105.49	93.00	104.92	100.00
1994	91.38	89.18	106.59	87.92	94.35	117.90	
	115.58	100.01	93.81	105.30	93.09	104.58	99.97
1995	91.38	90.14	106.25	88.51	93.96	115.95	
	116.66	100.45	94.01	105.18	93.19	103.15	99.90
1996	92.11	91.41	105.82	89.59	93.22	113.06	
	118.37	101.35	94.46	104.56	92.99	101.15	99.84
1997	93.30	92.49	105.94	90.87	92.76	109.60	
	120.30	102.34	94.72	103.90	92.84	98.34	99.78
1998	95.16	93.03	106.36	92.39	92.22	106.66	
	122.30	103.38	94.82	102.81	92.68	95.60	99.78
1999	96.85	93.05	107.34	93.64	92.21	104.21	
	123.89	104.16	94.61	102.13	92.66	92.85	99.80
2000	98.39	93.03	108.33	94.47	92.43	102.40	
	124.89	104.55	94.58	101.68	92.78	91.01	99.88
AVGE	93.75	91.38	106.69	90.63	93.23	111.03	
	119.64	102.01	94.34	103.88	92.90	98.95	

Table Total- 9587.50 Mean- 99.87 Std. Dev.- 9.11
Min - 87.64 Max - 124.89

D 10.A Final seasonal component forecasts
From 2001.Jan to 2001.Dec
Observations 12

	Jan / Jul	Feb / Aug	Mar / Sep	Apr / Oct	May / Nov	Jun / Dec	AVGE
2001	99.19	93.08	109.04	94.76	92.84	101.43	
	125.17	104.57	94.62	101.61	92.92	90.19	99.95

td, ramadan, outliers(ao), critical=4.00 PAGE 4, SERIES dat10

D 11 Final seasonally adjusted data
(also adjusted for trading day, holiday)
From 1993.Jan to 2000.Dec
Observations 96

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	TOTAL
1993	1022.17	977.84	806.55	1272.51	987.51	1130.60	
	1065.65	1089.11	1042.47	1006.42	987.52	1070.94	12459.29
1994	1028.60	905.64	1070.42	1131.32	1167.97	1185.47	
	1143.55	1147.26	1166.78	1236.50	1302.08	1248.08	13733.68
1995	1270.28	1064.11	1307.06	1243.63	1432.98	1248.96	
	1318.73	1319.88	1357.35	1347.87	1311.77	1327.30	15549.91
1996	1299.31	1339.85	1348.48	1270.19	1341.51	1276.34	
	1224.67	1223.68	1246.13	1259.06	1228.08	1231.16	15288.48
1997	1113.61	1405.98	1136.53	1239.79	1183.43	1303.42	
	1292.49	1294.54	1298.16	1289.95	1347.82	1366.03	15271.74
1998	1130.12	1528.69	1215.47	1499.40	1310.17	1310.40	
	1354.84	1396.22	1366.41	1395.92	1361.26	1401.89	16270.79
1999	1531.43	1561.20	1484.14	1565.24	1550.91	1518.28	
	1395.84	1571.01	1631.95	1602.26	1655.10	1659.11	18726.47
2000	1635.23	1599.15	1681.10	1627.78	1621.85	1559.17	
	1620.90	1558.30	1509.33	1497.70	1484.23	1381.02	18775.78
AVGE	1253.85	1297.81	1256.22	1356.23	1324.54	1316.58	
	1302.09	1325.00	1327.32	1329.46	1334.73	1335.69	

Table Total- 126076.14 Mean- 1313.29 Std. Dev.- 191.74
Min - 806.55 Max - 1681.10

td, ramadan, outliers(ao), critical=4.00 PAGE 5, SERIES dat10

D 16 Combined adjustment factors
(includes seasonal, trading day, holiday factors)
From 1993.Jan to 2000.Dec
Observations 96

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
1993	88.63	86.21	141.22	85.03	91.75	114.98	
	111.57	96.78	90.94	102.24	90.23	101.69	100.11
1994	88.57	86.68	140.79	85.30	91.44	114.39	
	112.02	96.93	91.02	102.06	90.32	101.36	100.07
1995	88.56	97.36	138.84	85.88	91.07	112.49	
	113.06	97.36	91.21	101.94	90.41	99.98	99.85
1996	89.28	120.98	102.56	86.92	90.35	109.69	
	114.72	98.23	91.64	101.35	90.22	98.04	99.50
1997	90.43	122.41	102.68	88.16	89.91	106.34	
	116.60	99.19	91.90	100.70	90.07	95.31	99.47
1998	115.39	100.48	103.09	89.64	89.38	103.48	
	118.54	100.20	91.99	99.65	89.92	92.66	99.53
1999	127.92	90.44	104.03	90.85	89.37	101.10	
	120.07	100.95	91.79	98.99	89.90	89.99	99.62
2000	129.96	90.42	104.99	91.66	89.59	99.35	
	121.04	101.33	91.76	98.55	90.01	120.20	102.40
AVGE	102.34	99.37	116.02	87.93	90.36	107.73	
	115.95	98.87	91.53	100.68	90.14	99.90	

Table Total- 9606.61 Mean- 100.07 Std. Dev.- 12.54
Min - 85.03 Max - 141.22

D 16.A Combined adjustment component forecasts
From 2001.Jan to 2001.Dec
Observations 12

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
2001	96.14	90.47	105.68	91.93	89.98	98.41	
	121.31	101.36	91.80	98.48	90.15	119.12	99.57

td, ramadan, outliers(ao), critical=4.00 PAGE 6, SERIES dat10

D 18 Combined calendar adjustment factors
(includes trading day, holiday factors)
From 1993.Jan to 2000.Dec
Observations 96

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
1993	101.51 101.51	101.38 101.51	84.22 101.47	101.47 101.51	101.51 101.47	101.47 101.51	 100.05
1994	101.51 101.51	101.38 101.51	84.22 101.47	101.47 101.51	101.51 101.47	101.47 101.51	 100.05
1995	101.51 101.51	96.06 101.51	89.54 101.47	101.47 101.51	101.51 101.47	101.47 101.51	 100.05
1996	101.51 101.51	84.08 101.51	101.51 101.47	101.47 101.51	101.51 101.47	101.47 101.51	 100.05
1997	101.51 101.51	84.08 101.51	101.51 101.47	101.47 101.51	101.51 101.47	101.47 101.51	 100.05
1998	89.54 101.51	96.06 101.51	101.51 101.47	101.47 101.51	101.51 101.47	101.47 101.51	 100.05
1999	84.22 101.51	101.38 101.51	101.51 101.47	101.47 101.51	101.51 101.47	101.47 101.51	 100.05
2000	84.22 101.51	101.38 101.51	101.51 101.47	101.47 101.51	101.51 101.47	101.47 84.22	 98.60
AVGE	95.69 101.51	95.72 101.51	95.69 101.47	101.47 101.51	101.51 101.47	101.47 99.35	

Table Total- 9587.10 Mean- 99.87 Std. Dev.- 4.78
Min - 84.08 Max - 101.51

D 18.A Combined calendar adjustment component forecasts
From 2001.Jan to 2001.Dec
Observations 12

	Jan Jul	Feb Aug	Mar Sep	Apr Oct	May Nov	Jun Dec	AVGE
2001	101.51 101.51	101.38 101.51	101.51 101.47	101.47 101.51	101.51 101.47	101.47 84.22	 100.05

td, ramadan, outliers(ao), critical=4.00 PAGE 7, SERIES dat10

F 2. Summary Measures

F 2.A: Average percent change without regard to sign over the indicated span

Span in months	B1 O	D11 CI	D13 I	D12 C	D10 S	A2 P	D18 TD&H	F1 mcd
1	16.04	6.62	6.39	1.05	10.40	0.00	5.37	1.02
2	15.63	5.93	5.39	2.08	10.84	0.00	5.86	1.89
3	15.27	7.31	6.18	3.03	9.67	0.00	5.55	2.65
4	14.62	6.99	5.35	3.89	10.34	0.00	5.62	3.38
5	15.65	8.02	5.61	4.68	10.75	0.00	5.64	4.15
6	15.70	8.41	5.33	5.36	12.04	0.00	5.77	4.93
7	15.66	9.13	5.62	6.01	9.81	0.00	5.77	5.66
8	15.87	9.08	5.40	6.63	10.28	0.00	5.88	6.32
9	16.37	9.63	5.56	7.26	9.32	0.00	5.93	6.95
10	19.12	9.79	5.38	7.98	10.25	0.00	5.98	7.64
11	16.83	10.45	5.21	8.66	10.60	0.00	3.76	8.37
12	11.44	10.34	4.99	9.35	0.87	0.00	1.91	9.02

Span in months	E1 Mod.O	E2 Mod.CI	E3 Mod.I
1	15.68	3.16	2.90
2	16.29	3.50	2.82
3	14.93	4.33	2.98
4	14.11	4.91	2.68
5	15.49	5.67	2.62
6	14.47	6.03	2.38
7	14.83	6.83	2.64
8	15.42	7.14	2.57
9	16.22	7.93	2.63
10	19.19	8.46	2.61
11	16.85	9.30	2.59
12	10.62	9.86	2.97

F 2.B: Relative contributions to the variance of the percent change in the components of the original series

Span in months	E3 I	D12 C	D10 S	A2 P	D18 TD&H	TOTAL	RATIO (X100)
1	5.76	0.75	73.79	0.00	19.70	100.00	59.55
2	4.86	2.63	71.57	0.00	20.95	100.00	61.81
3	6.24	6.46	65.70	0.00	21.61	100.00	63.89
4	4.46	9.40	66.49	0.00	19.66	100.00	80.80
5	3.91	12.43	65.60	0.00	18.07	100.00	73.49
6	2.65	13.50	68.22	0.00	15.63	100.00	101.59
7	4.03	20.91	55.79	0.00	19.27	100.00	78.45
8	3.48	23.06	55.36	0.00	18.11	100.00	80.26
9	3.80	28.99	47.86	0.00	19.34	100.00	69.06
10	3.23	30.15	49.70	0.00	16.93	100.00	57.37
11	3.22	36.02	53.96	0.00	6.79	100.00	73.39
12	8.77	86.84	0.76	0.00	3.63	100.00	89.27

F 2.C: Average percent change with regard to sign and standard deviation over indicated span

Span in months	B1 O Avg.	B1 O S.D.	D13 I Avg.	D13 I S.D.	D12 C Avg.	D12 C S.D.
1	2.70	21.72	0.44	10.65	0.40	1.17
2	3.10	20.60	0.26	7.71	0.83	2.30
3	3.14	18.89	0.64	9.43	1.28	3.33
4	3.51	20.07	0.28	7.61	1.75	4.24
5	4.16	20.01	0.39	8.00	2.23	5.01
6	4.64	19.56	0.35	7.85	2.73	5.67
7	4.91	18.78	0.36	8.18	3.25	6.25
8	5.54	20.27	0.31	7.94	3.81	6.79

9	5.94	19.21	0.35	8.38	4.42	7.30
10	7.42	23.39	0.39	8.06	5.06	7.77
11	7.43	19.92	0.39	7.79	5.74	8.19
12	7.27	13.40	0.26	7.07	6.43	8.56

Span in months	D10 S Avg.	S.D.	D11 CI Avg.	S.D.	F1 mcd Avg.	S.D.
1	0.70	12.01	0.85	10.81	0.44	1.15
2	1.05	14.55	1.10	8.28	0.91	2.10
3	0.76	12.85	1.94	10.33	1.37	2.90
4	0.90	12.86	2.04	9.05	1.88	3.64
5	1.14	14.21	2.64	9.76	2.44	4.35
6	1.21	14.06	3.09	9.87	3.03	4.98
7	0.92	12.62	3.61	10.45	3.65	5.49
8	0.85	13.12	4.13	10.64	4.31	5.91
9	0.73	11.64	4.77	11.37	5.01	6.29
10	1.00	13.61	5.45	11.28	5.72	6.66
11	0.80	12.09	6.13	11.67	6.40	7.04
12	0.00	1.17	6.68	11.19	7.06	7.42

F 2.D: Average duration of run

CI	I	C	mcd
1.56	1.46	9.50	4.94

F 2.E: I/C Ratio for months span

SPAN	1	2	3	4	5	6
I/C	6.09	2.59	2.04	1.38	1.20	1.00

SPAN	7	8	9	10	11	12
I/C	0.94	0.81	0.77	0.67	0.60	0.53

months for cyclical dominance: 6

F 2.F: Relative contribution of the components to the stationary portion of the variance in the original series

I	C	S	P	TD&H	Total
3.02	16.88	42.00	0.00	39.93	101.83

F 2.G: The autocorrelation of the irregulars for spans 1 to 14

SPAN	1	2	3	4	5	6	7
ACF	-0.45	0.16	-0.22	0.08	0.00	0.02	-0.05

SPAN	8	9	10	11	12	13	14
ACF	0.02	-0.04	-0.03	0.00	0.27	-0.18	0.15

F 2.H: The final I/C Ratio from Table D12: 2.63
The final I/S Ratio from Table D10: 2.84

F 2.I:

		Statistic	Prob. level
F-test for stable seasonality from Table B 1.	:	11.782	0.00%
F-test for stable seasonality from Table D 8.	:	12.049	0.00%
Kruskal-Wallis Chi Squared test for stable seasonality from Table D 8.	:	54.112	0.00%
F-test for moving seasonality from Table D 8.	:	1.592	15.04%

```
      td, ramadan, outliers(ao), critical=4.00          PAGE   9, SERIES dat10

F 3. Monitoring and Quality Assessment Statistics
      All the measures below are in the range from 0 to 3 with an
      acceptance region from 0 to 1.

   1. The relative contribution of the irregular over three        M1  = 0.624
      months span (from Table F 2.B).

   2. The relative contribution of the irregular component         M2  = 0.302
      to the stationary portion of the variance (from Table
      F 2.F).

   3. The amount of month to month change in the irregular         M3  = 0.815
      component as compared to the amount of month to month
      change in the trend-cycle (from Table F2.H).

   4. The amount of autocorrelation in the irregular as            M4  = 0.126
      described by the average duration of run (Table F 2.D).

   5. The number of months it takes the change in the trend-       M5  = 1.095
      cycle to surpass the amount of change in the irregular
      (from Table F 2.E).

   6. The amount of year to year change in the irregular as        M6  = 0.464
      compared to the amount of year to year change in the
      seasonal (from Table F 2.H).

   7. The amount of moving seasonality present relative to         M7  = 0.699
      the amount of stable seasonality (from Table F 2.I).

   8. The size of the fluctuations in the seasonal component       M8  = 0.981
      throughout the whole series.

   9. The average linear movement in the seasonal component        M9  = 0.929
      throughout the whole series.

  10. Same as 8, calculated for recent years only.                 M10 = 1.292

  11. Same as 9, calculated for recent years only.                 M11 = 1.265

          *** ACCEPTED *** at the level   0.72

          *** Check the  3 above measures which failed.

          *** Q (without M2) =  0.77  ACCEPTED.
```

OPERATIONAL MANUAL FOR BENCHMARKING USING THE *BENCH* PROGRAM

Report # 57

by
John Kuiper

July, 2002

Statistical Assistance to the Government of Indonesia (STAT) Project
USAID Contract No. PCE-I-00-99-00009-00

TABLE OF CONTENTS

I. INTRODUCTION

This is an operational manual produced for BPS on benchmarking using the BENCH program, the statistical software which is widely used by statistical agencies for benchmarking monthly or quarterly data to annual data. The program was developed at Statistics Canada in the early 1990s by Pierre Cholette.[1] The idea of producing the present manual was discussed by this author with Cholette, who kindly provided suggestions and recommendations for inclusion. Parts of this manual, which were deemed important for the purpose of this documentation, were based on the presentation by Cholette, but were adapted to the conditions most likely to be faced by BPS in benchmarking its various series.

The manual was written with two things in mind: first, that the focus be on mechanical operation of the program, not conceptual coverage; and secondly, that it emphasize primarily the Proportional Denton Method, which is the method widely considered to produce optimal results for the types of applications that BPS is likely to encounter.

II. BASIC CONCEPTS

A. Benchmarking

The purpose of benchmarking is to combine the relative strengths of low frequency data (completeness) and high-frequency data (sub-annual timely coverage) into a consistent sub-annual time series. The two series generally show inconsistent movements over time, but movements in the benchmarks are believed to be more reliable, since coverage is more complete. The mechanical computation of the resulting "benchmarked series" for a particular period will depend on:

(1) the movements, but not the level, of the short-term indicator series within a particular year,

(2) the level of the benchmark for that year and

(3) the level of the benchmark for several preceding and following years.

The general objective of benchmarking is to preserve as much as possible the short-term movements in the indicator series under the restrictions imposed by the annual benchmarks and to ensure that for the most current year, i.e. the year for which the benchmark is not yet available, the sum of the sub-annual levels will be as close as possible to the as yet unknown benchmark.

---

[1] Pierre A. Cholette, "User's Manual of Programme BENCH", Working Paper TSRA-90-008, Time Series Research and Analysis Division, Statistics Canada, August 1994.

Interpolation refers to the situation where an annual benchmark is available for the target variable, but no sub-annual series exists for the same variable. In this case a proxy variable has to be used to obtain the sub-annual pattern (for example, a trend variable).

There are two general approaches to benchmarking: statistical modeling methods and numerical methods. The statistical modeling approach includes specifications of the error structure, whereas the numerical approach ignores these specifications. The statistical modeling approach includes a number of Generalized Least Squares regression models developed at Statistics Canada, ARIMA models, and State Space models. They collapse to numerical methods when information on the coefficients of variation and on the autocorrelations of the sub-annual observations are not used. The numerical approach includes a number of minimization methods proposed by Denton[2] and others. In the following two sections the Statistics Canada regression models and the Denton models will be discussed in more detail.

B. Regression Models

Three statistical benchmarking models, the additive, multiplicative and mixed models are included in the BENCH program. The solutions for all three models are provided in Cholette[3] and the one for the additive model is also presented in Appendix A, since this is the model on which this manual focuses.

1. Additive Model

The additive regression model consists of two linear equations:

$$s_t = a + b_t + e_t \tag{1a}$$

$$E(e_t) = 0, \quad E(e_t\, e_{t-k}) = \sigma_{e_t}\sigma_{e_{t-k}}\,\rho_k,\; t=1,...T$$

subject to

$$y_m = (\sum_{t\in m} b_t)/p_m + w_m$$

$$E(w_m) = 0, \quad E(w_m^2) = \sigma_{w_m}^2,\; m=1,...M \tag{1b}$$

[2] Frank T. Denton, "Adjustment of Monthly or Quarterly Series to Annual Totals: An Approach Based on Quadratic Minimization", Journal of the American Statistical Association, March 1971.

[3] Cholette, *op. cit*, pp. 41-44.

where

s_t is the observed sub-annual series,
b_t the true but unknown benchmarked series of sub-annual values,
a an unknown constant bias,
e_t the error term of the sub-annual series,
y_m the series of annual benchmarks,
p_m is set to 1 for flow and stock series and to the number of sub-annual observations for index series and
w_m is the error term of the annual benchmarks.

The errors e_t and w_m are mutually uncorrelated.

2. Multiplicative Model

The multiplicative regression model is a logarithmic variant of the previous model. It states that the bias, the errors and the true sub-annual values *multiply* to generate the sub-annual observations:

$$s_t = a \times b_t \times e_t.$$

Taking the natural logarithmic transformation, the model becomes

$$ln\ s_t = ln\ a + ln\ b_t + ln\ e_t \tag{2a}$$

$$E(ln\ e_t) = 0, \qquad E(ln\ e_t\ ln\ e_{t-k}) = \sigma_{ln\, e_t} \sigma_{ln\, e_{t-k}}\ \rho_k,\ t=1,...T$$

subject to

$$y_m = (\sum_{t \in m} b_t)/p_m + w_m \tag{2b}$$

$$E(w_m) = 0, \qquad E(w_m^2) = \sigma^2_{w_m},\ m=1,...M$$

where ρ_k's are as in the previous model and where $\sigma_{ln\ e_t} = \sigma_{e_t}/s_t$. The errors in the benchmarks are additive, but may behave multiplicatively if their variance is defined in terms of coefficients of variation.

3. Mixed Model

In the mixed regression model, the bias is multiplicative but the error is additive. This may be useful because subject matter specialists often think of the bias as a percentage of the sub-annual series. The model is as follows:

$$s_t = a \times b_t + e_t \tag{3a}$$

$$E(e_t) = 0, \qquad E(e_t\ e_{t-k}) = \sigma_{e_t} \sigma_{e_{t-k}}\ \rho_k,\ t=1,...T$$

subject to

$$y_m = (\sum_{t \in m} b_t)/p_m + w_m \tag{3b}$$

$$E(w_m) = 0, \quad E(w_m^2) = \sigma^2_{w_m}, \; m=1,...M$$

where the autocorrelations ρ_k are as in the additive regression model. The additive errors may behave multiplicatively if their variance is defined in terms of coefficients of variation.

C. Denton Models

Denton proposed an additive and a proportional benchmarking technique, both of which are based on the minimization of the discrepancies between the original series and the benchmarked series in a least squares sense. The Additive Denton Method minimizes the differences in the absolute change between the benchmarked series and the indicator series, subject to the constraints provided by the annual benchmarks, i.e.

$$\min \sum_{t=2}^{T} [(b_t - b_{t-1}) - (s_t - s_{t-1})]^2 \tag{4}$$

The Proportional Denton Method minimizes the differences in the ratios of the benchmarked series and the indicator series, subject to the constraints provided by the annual benchmarks, i.e.

$$\min \sum_{t=2}^{T} [(\frac{b_t}{s_t}) - (\frac{b_{t-1}}{s_{t-1}})]^2 \tag{5}$$

Thus the Proportional Denton Method keeps the benchmarked series as proportional as possible to the indicator series by minimizing (in a least-squares sense) the difference in relative adjustment to neighboring sub-annual periods subject to the constraints provided by the annual benchmarks.

Because most seasonal macroeconomic series show fluctuations which tend to be multiplicatively distributed around the trend of the series, the Proportional Denton Method preserves seasonal and other short-term fluctuations in the series better than the Additive Denton Method. Figure 1 shows that the turning points in the benchmarked series using the Proportional Denton Method, track the turning points in the indicator series quite well.

D. Prorating and the Step Problem

One method to relate the benchmarks to the indicator series is “prorating”, i.e. by distributing annual totals in proportion to the sub-annual distribution (prorata distribution) of the indicator for the same year. The simplicity of this method is highly attractive, which may be highly tempting to some users. However, the method causes implausible discontinuities between years, the so-called "step problem". If an indicator is not growing as fast as the benchmark, then the growth rate in the benchmarked series needs to be higher than in the indicator. With prorata distribution, the entire increase in the sub-annual growth rates is put into the first sub-annual period, while the other sub-annual growth rates are left unchanged.

The step problem is best illustrated by looking at the ratio of the annual benchmark to the average of the sub-annual periods of the indicator (the "benchmark to indicator" --BI-- ratio). Figures 1 through 3 provide a good example of these issues using actual data from BPS's Monthly/Quarterly Survey of Non-Oil Manufacturing establishments. The survey provides both a monthly and quarterly index, used here as the "indicator series". Data from the annual census of manufacturing data, used here as "the benchmarks", are available about 15 months after the end of the reference year. The example is limited to three years for the purpose of illustration.

Figure 1 presents the original series, the benchmarks, and the series benchmarked using the Proportional Denton Method. Figure 2 presents the original series, the benchmarks and the series benchmarked using the prorating method. The step problem becomes clear in 1996 Q1, where the prorating method shows an increase of 8.2%, even though the original series shows a decrease of 10.2%. Compare that with the results of the Proportional Denton Method in Figure 1, where the benchmarked series shows a drop of 3.2%. Figure 3 shows the BI ratios using the two methods. Note how clearly the step problem is depicted in 1996 Q1.

Figure 1: Benchmarking Using the Proportional Denton Method

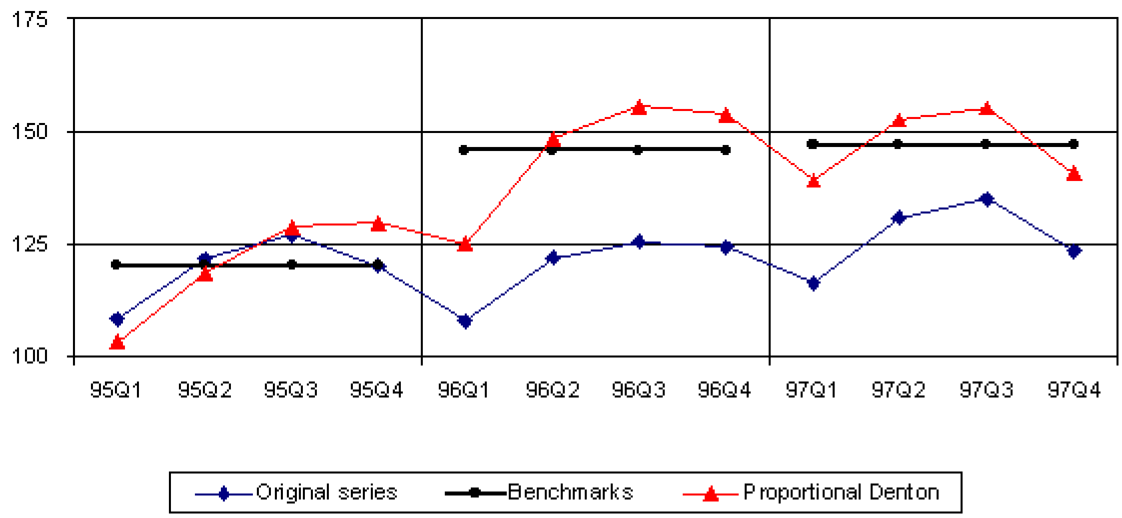


Figure 2: Benchmarking Using the Prorating Method

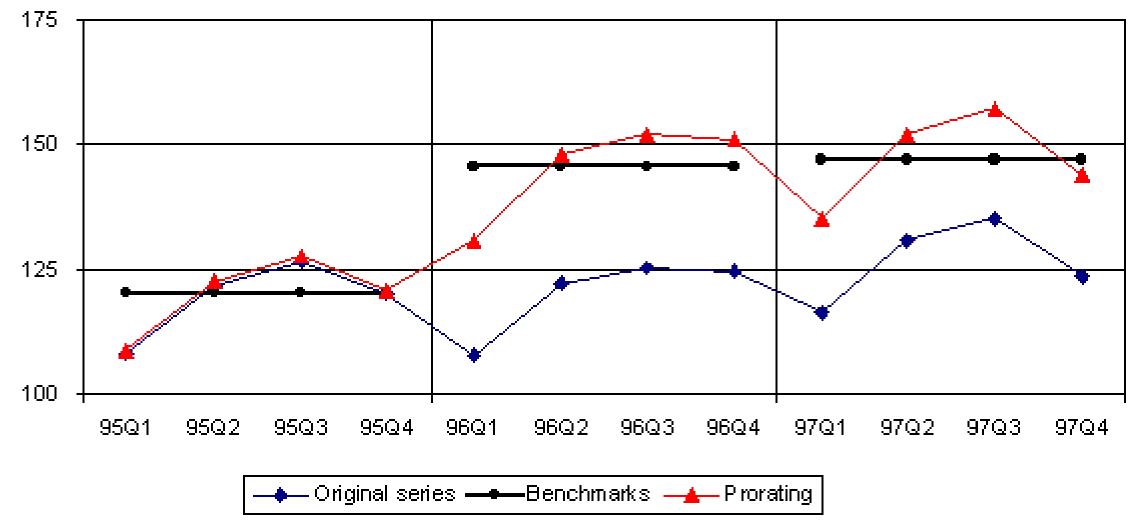
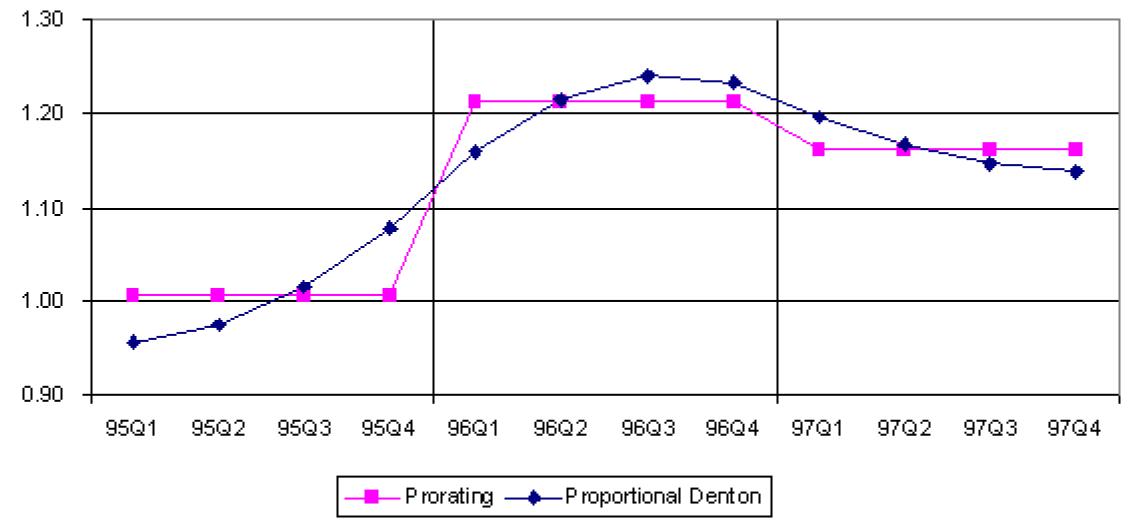


Figure 3: Benchmark-to-Indicator Ratio - Proportional Denton vs Prorating



III. FILES AND OPTIONS IN BENCH

This section describes the input files required and the output files produced by the BENCH program. The program requires four input files:

(1) a *format statement file* called "`bench.fil`", which contains the file names and formats of the other files used by the program.

(2) an *option file*, which contains the options used for each *pair* of original series and benchmarks to be benchmarked.

(3) the *file of the original data series*, which contains the sub-annual values to be benchmarked.

(4) the *file of the benchmarks*, which contains the annual values of the benchmarks.

The program produces two output files:

(1) a *log output* file called "`bench.log`", which contains statistics, plots and error messages.

(2) the *file of the benchmarked series*, which contains the benchmarked (or the interpolated) values.

This section will rely on the same example used in the previous one, benchmarking the manufacturing production survey, to illustrate various commands used in the program.

A. Format Statement File

1. Rules for Format Statements

File "`bench.fil`" supplies the file names and record layouts of all files used by the program. This file *must* exist. The record layouts are described by means of Fortran format statements. Table 1 presents an example of file "`bench.fil`". The first record (or line) of the file pertains to the option file. The next three records pertain to the file of the original series, the file of the benchmarks and the file of the benchmarked series, respectively.

Table 1
Illustrative Example of the Format Statement File

```
index01.opt
index01.ori       (a10,6i5,f12.0,f3.0)
index01.ben       (a10,6i5,f12.0,f3.0)
index01.out       (a10,6i5,f12.3,f10.3)
```

File names

The first part of each record of the format statement file provides the names for the files to be processed by the program. The file name must start in column 1, it has a maximum length of 20 characters. An example is the file name "`index01.opt`", which must be present in the current directory, because the filename does not include directory information. Alternatively, the file name may contain directory information. For example, file name "`c:\user\index01.opt`", indicates that the option file is located in sub-directory "`c:\user\`"

Record layouts

The second part of the records of file "`bench.fil`" provides the record layout or *format* of each file to be processed. The format statement starts with a left bracket "`(`", located anywhere after the file name, and its maximum length is 60 characters. For the option file, no format is entered. For the other files, the formats supplied must meet the following requirements:

(1) each record may contain only one observation.

(2) each record must refer to the series identifier; the reference periods covered by the observation on the record, namely the *starting year*, the *starting month*, the *starting day*, the *ending year*, the *ending month* and the *ending day*; the observation of the series; and, if applicable, the coefficient of variation.

2. Reference periods

The characterization of the reference periods (in terms of starting and ending year, month and day) allows the program to process a wide range of socio-economic data: daily, monthly, quarterly, semi-annual, annual, bi-annual, quinquennial, decennial etc.; and even data with irregular reference periods, like data covering sometimes four weeks and sometimes five.

Flexible reference periods for benchmarks

In order to accommodate all the situations described in Section II, the BENCH program allows for benchmarks of *any* frequency, e.g. annual, bi-annual, quinquennial, quarterly, monthly, weekly, daily, etc. This is achieved by *reference periods*, specified by the starting year, the starting month, the ending year and the ending month, covered by each benchmark. Thus, one benchmark may cover 15 months and the next benchmark 12 months. Some sub-annual periods may even be covered by more than one benchmark, for instance by a quarterly benchmark and an annual benchmark.

Fiscal benchmarks

As a particular case of this feature, the benchmarks may be *fiscal*, i.e. they may refer to fiscal (instead of calendar) years, to fiscal quarters, or to periods of four or five weeks. In the latter case, the reference periods are specified by the starting year, the starting month, the starting day, the ending year, the ending month and the ending day of each benchmark.

Sub-annual benchmarks

Benchmarks covering only one sub-annual period of the original series are referred to as "sub-annual benchmarks". Such benchmarks are very useful:

(1) To force a benchmarked series to start from a specific value, in order to avoid revisions to values deemed "historical" or "final" prior to a certain date.

(2) To force a benchmarked series to run through a specific value.

(3) To force a benchmarked series to end at a specific value. This feature may be used to link an "old" survey with a "new" survey, pertaining to the same variable, by specifying one new value (or the average of a few new values) as a sub-annual benchmark on the overlapping periods of the two surveys.

(4) To accommodate stock series.

The reference periods of quarterly data may be specified in terms of quarters or months. For example, a quarterly observation for the third quarter of 2001 would normally have: starting year 2001, starting quarter 3, ending year 2001 and ending quarter 3. However, it is also possible to use: starting year 2001, starting month 7, ending year 2001 and ending month 9; if the benchmark for 2001 covers sub-annual periods 1 to 12.

When monthly, quarterly or annual data are used, the starting and ending days are irrelevant. Although BENCH requires them, they should be set equal to the starting and ending months for the observation.

3. Option File Formats

The first record of file "`bench.fil`" defines the option file. This file contains the options to be used in benchmarking each pair of original and benchmark values. In the example in Table 1, the options used for the example are located in file "`index01.opt`".

4. Formats for the Original Series File

The second record of file "`bench.fil`" refers to the file of the sub-annual series to be benchmarked. Its extension must be "`ori`". In the example in Table 1, the benchmarks of the manufacturing production index are located in file "`index01.ori`".

Record Layout

The record layout must be such that the information on each record is read in the following order:

- series identifier
- reference period of the observation, i.e. starting year, starting month, starting day, ending year, ending month and ending day
- value of the observation
- dispersion value of the observation.

For example, format statement "`(a10,6i5,f10.0,f5.0)`" would cause BENCH to read the series identifier from columns 1 to 10 (item "`a10`" in the format statement); the starting year, month and day and the ending year, month and day from the following 6 fields of 5 columns ("`6i5`"); the value of the benchmark from columns 41 to 50 ("`f10.0`"); and the dispersion value from the following field of 5 columns ("`f5.0`").

The dispersion values for the values of the original series must be positive. The default value is 0.1, which is interpreted as 1.0%. Each entry must be right-justified in its field, except for the series identifier, which is entered left justified.

5. Formats for the file of benchmarks

The third record of file "`bench.fil`" refers to the file of the benchmarks. Its extension must be "`ben`". In the example in Table1, the benchmarks for the manufacturing production index are located in file "`index01.ben`". The rules given for the file of original series also hold for the file of benchmarks.

A benchmark is *binding* when its variance is zero; and *non-binding* otherwise. If a benchmark is binding, the benchmarked series sums (or averages) exactly to a binding benchmark over the reference periods of the benchmark. Benchmarks should be specified as binding when they provide a fully reliable measurement of both the level and of the super-annual (trend-cyclical) movement of the target variable. On the other hand, benchmarks should be specified as non-binding when they provide a reliable measurement of the (average) level of the target variable but not of the super-annual movement. The default value for the dispersion of the benchmarks is 0, which implies that the benchmarks are binding.

6. Formats for the Benchmarked Series File

The fourth record of file "`bench.fil`" refers to the file of estimated benchmarked series. In the example in Table 1, the benchmarked manufacturing production index is located in file "`index01.out`". BENCH writes the information for each output record in the following order:

- series identifier
- reference periods (starting year, month and day and ending year, month and day)

- value of the benchmarked observation
- dispersion value of the benchmarked observation.

B. Program Options

1. Syntax of Option Keywords

The program options are keyword-driven. The keywords have the following syntax:

(1) Each keyword consists of a string of 4 characters ending with the equal sign ("="). In most cases, the first 3 characters correspond to the 3 first letters of the option considered. For instance, keyword "sea" controls the search option.

(2) Each keyword is followed by an *entry*. The entry starts with the first character following the "=" sign of the keyword and ends with the character preceding the first comma encountered. Depending on the keyword, the entries may be alpha-numeric or numeric.

(3) The options are separated by commas. They end with a semi-colon ("`;`"), which marks the end of the set of options.

(4) Only strings of four character ending with "=" are examined as potential keywords. Strings ending with "=", but not corresponding to any valid keyword, will generate an error message and abort the program.

(5) Each set of options used for one pair of original and benchmark values may occupy up to six lines.

(6) The maximum length of the entries is 10 for numeric entries, 20 for alpha-numeric entries and 70 for the title.

(7) For numeric entries, blanks are interpreted as zeroes. Thus "`int=1 ,`" would be interpreted as "`int=10,`"; and "`bia= 1,`", as "`bia=1,`".

(8) If only some of the program options are specified, internal default values are used for the missing options.

(9) Strings of any length not containing "=" may be placed in the option file to document the file.

Table 2 displays the option file "`index01.opt`" for the manufacturing production index at the 1 digit level.

Table 2
Illustrative Example of the Option File

```
tit=Manufacturing Production Index at the 1 digit level,
ids=input01,idb=bench01, idi=output01,
ysf=1995, msf=1, ysl=1997, msl=4,
ybf=1995, mbf=1, ybl=1996, mbl=4,
plc=0, sea=1, ind=1, cvs=0, bia=0;
```

The options are presented below in four groups: the identifier options, the control date options, the basic options and the ARMA options.

2. Identifier Options

The identifier keywords are used to identify the pairs of series to be processed and to match the set of options to the appropriate pairs of series in the input files.

Title Option:
Keyword "**`tit`**" sets the title (printed in the log output file) for the pair of series being processed. The title may contain up to 70 alpha-numeric characters and blanks. The title may not contain commas or equal signs, as these would truncate the entry.

Control Identifiers:
Keyword "**`ids `**" provides the control identifier for the original series; keyword "**`idb`**" for the set of benchmarks; and keyword "**`idi`**" for the benchmarked series. The control identifier may contain up to 20 alphanumeric characters including blanks, but no commas or equal signs. Valid examples are: "`ids=quar30`", "`idb=annual 30`".

Search Option:
Keyword **"sea"** determines the way the control identifiers and the series identifiers are matched. Matching occurs when the series identifiers in the input files are identical to the corresponding control identifiers in the option file. Since the program distinguishes between lower- and upper-case letters, control identifier "`Series 1`", for example, does *not* match series identifier "`series 1`".

When keyword "`sea=1`" is used, (i) *each* pair of control identifiers in the options file is read, (ii) the input files are searched for the series with matching series identifiers and (iii) each pair is processed according to the *specific set of options* chosen for that pair in the option file. Processing stops when the program hits the "end-of-file" in the option file.

When keyword "`sea=0`" is used, (i) the first original series is paired with the first set of benchmarks, (ii) the second original series is paired with the second set of benchmarks, etc. Each pair of series is processed according to the option sets encountered in the same order in the option file. Processing stops when the program hits the "end-of-file" on any one of the input files, except for the option file.

The search option may only be set with the first set of options in the option file. Once chosen, it cannot be changed. When the search option is active ("`sea=1`"), the sets of specific options may be in any order in the option file, because the input files are rewound after the processing of each pair of series.

For ease of reference, the identifier options and their internal default values are summarized in Table 3.

Table 3
Identifier Options and Default Values

Keyword	Entry	Description	Default Value
`"tit"`	any	Title for the benchmarking run	blank
`"ids"`	any	Control identifier for the original series	n/a
`"idb"`	any	Control identifier for the series of benchmarks	n/a
`"idi"`	any	Control identifier for the benchmarked series	"ids"
`"sea"`	0	No input file search for control identifiers	0
	1	Input file search for control identifiers	

3. Control Date Options

The control date options are used to select a range of dates for the series in the input files.

Control Dates for the Original Series:
Keywords **`"ysf"`**, **`"msf"`** and **`"dsf"`** specify the control starting year, starting month and starting day and keywords **`"ysl"`**, **`"msl"`** and **`"dsl"`** specify the control ending year, ending month and ending day to be processed for the original series. For example, `"ysf=1991, msf=3, ysl=1996, msl=9"`, processes the original series from March 1991 to September 1996.

The default value for the control dates is `"0"`, which indicates that the program processes the observations for all dates. When the input series does not refer to daily data, the control starting day and the control ending day options must be left unspecified.

Control Dates for the Benchmarks:
Keywords **`"ybf"`**, **`"mbf"`** and **`"dbf"`** specify the control starting year, starting month and starting day; and keywords **`"ybl"`**, **`"mbl"`** and **`"dbl"`** specify the control ending year, ending month and ending day to be processed for the benchmarks. The rules for the control dates of the benchmarks are the same as those for the original series.

The control date options and their internal default values are summarized in Table 4.

Table 4
The Control Date Options and Default Values

Keyword	Entry	Description	Default Value
"ysf"	numeric	Control starting year for the original series	0
"msf"	numeric	Control starting month for the original series	0
"dsf"	numeric	Control starting day for the original series	0
"ysl"	numeric	Control ending year for the original series	0
"msl"	numeric	Control ending month for the original series	0
"dsl"	numeric	Control ending day for the original series	0
"ybf"	numeric	Control starting year for the series of benchmarks	0
"mbf"	numeric	Control starting month for the series of benchmarks	0
"dbf"	numeric	Control starting day for the series of benchmarks	0
"ysl"	numeric	Control ending year for the series of benchmarks	0
"msl"	numeric	Control ending month for the series of benchmarks	0
"dsl"	numeric	Control ending day for the series of benchmarks	0

Note: The default value of "0" indicates that the series are processed for all available dates

4. Basic Options

The basic options are mainly methodological. For example, they specify whether the time series is an index or a flow series.

Model Option:
Keyword **`"met"`** determines which of three benchmarking models is estimated. An entry of "`0`" requests the additive model; an entry of "`1`", the mixed model; and an entry of "`2`", the multiplicative (log-additive) model.

Non-positive values in the original series or in the benchmarks, combined with the multiplicative ("`met=2`") or the mixed model ("`met=1`"), result in an error message and program abortion.

Index Option:
Keyword **`"ind"`** specifies whether the series is an index series or not. For an index series, the benchmarked series averages to the benchmark values over the reference periods of the benchmarks, instead of summing to the benchmarks. An entry of "`0`" indicates a flow or a stock series, and an entry of "`1`" indicates an index series.

Measure of Dispersion Options:
Each observation on the data input and output files is read (and written) with a corresponding measure of dispersion (i.e. of reliability). The measure of dispersion options determine whether the *dispersion values* are coefficients of variation, standard deviations or variances.

The dispersion values are transformed by the program into variances. Each sub-annual and annual observation will be weighted with the inverse of its variance. The benchmarked series will run closer to the indicator series the lower its variance.

Keyword **`"cvs"`** refers to the original series, keyword **`"cvb"`** to the benchmarks and keyword **`"cvi"`** to the benchmarked series. An entry of "`0`" specifies that the dispersion values are coefficients of variation; an entry of "`1`", standard deviations; and "`2`", variances. The *coefficient of variation* is defined as the standard deviation of the observation divided by the value of the observation, times *100%*.

Non-positive values in the original series or the benchmarks produce an error message and abortion of the program, if the measure of dispersion option is set to 0.

Bias Option:
Keyword **`"bia"`** determines whether the program estimates a bias parameter as part of the model. An entry of "`1`" indicates that bias estimation is to be performed; and of "`0`" that no bias estimation is to be performed.

Moving Estimation Option:
Keyword **`"int"`** sets the length of the moving estimation intervals, in number of benchmarks. An entry of "`0`" specifies no moving interval; in other words, the estimation interval covers the whole series. The default value is 5, i.e. each estimation interval covers the reference periods of five benchmarks.

The entry would normally be an odd number. For series shorter than the length specified with the keyword, the estimation interval will cover the whole series. A moving estimation interval of 2 is appropriate for stock series if the ARMA model selected (see below) is first-order autoregressive. The estimates are then identical to those obtained on longer intervals.

The maximum interval is 42. Entries larger than 42 are replaced by 42. If a seasonal ARMA model is chosen for the error, the moving estimation interval should be set to cover the whole series, e.g. by entering "`int=0`". If the reference periods of two or more benchmarks overlap, that is some periods of the original series are covered by more than one benchmark, the moving estimation interval should be set to cover the whole series, e.g. "`int=0`".

Link Option:
Keyword **`"lin"`** determines whether links are made between estimation intervals. An entry of "`1`" specifies a link; and "`0`" no link. If the link option is used, no dispersion values are calculated for the benchmarked series. The reason is that the dispersion of the benchmarked series would be underestimated at the link points.

For ease of reference, the basic options and their internal default values are presented in Table 5.

Table 5
Basic Options and Default Values

Keyword	Entry	Description	Default Value
"bia"	0	Bias parameter not calculated	0
	1	Bias parameter calculated for each estimation interval	
"cvs"	0	Coef. of variation as dispersion of the original series	0
	1	Standard deviation as dispersion of the original series	
	2	Variance as dispersion of the original series	
"cvb"	0	Coef. of variation as dispersion of the benchmarks	0
	1	Standard deviation as dispersion of the benchmarks	
	2	Variance as dispersion of the benchmarks	
"cvi"	0	Coef. of variation as dispersion of the benchmarked series	0
	1	Standard deviation as dispersion of the benchmarked series	
	2	Variance as dispersion of the benchmarked series	
"ind"	0	Flow or stock series	0
	1	Index series	
"int"	numeric	Length of the moving estimation interval	5
"lin"	0	No link between the estimation intervals	0
	1	Link between the estimation intervals	
"met"	0	Additive benchmarking model	0
	1	Mixed benchmarking model	
	2	Multiplicative benchmarking model	
"pls"	0	No plot of the benchmarked series	0
	1	Plot of the benchmarked series	
"plc"	0	No plot of the corrections	1
	1	Plot of the corrections	

5. ARMA Options

ARMA models are often denoted as $(p,q)(P,Q)_s$; and the parameters as ${}_1,\ldots,{}_p$, ${}_1,\ldots,{}_p$, ${}_1,\ldots,{}_p$, and ${}_1,\ldots,{}_p$. BENCH allows only for seasonal ARMA models which are multiplicative (the regular part multiplying the seasonal part). However, non-multiplicative seasonal models may be entered by specifying regular autoregressive (and/or moving average) polynomials of orders larger than s ($p,q>s$). Note that parameter ${}_k$ (or ${}_k$) is assumed to be of order k; however the value of ${}_k$ may be set equal to zero. For seasonal models, the estimation should not be carried out on moving intervals as this would cause discontinuities in the estimated seasonal pattern. Thus keyword "`int`" should be set to 0 in this case.

ARMA options define the ARMA model for the error in the original series. The ARMA model is specified by five keywords, "**`p-r`**", "**`q-r`**", "**`p-s`**", "**`q-s`**" and "**`n-s`**", which respectively control p, the number of *regular* autoregressive parameters (with a maximum of 25),

q, the number of regular moving average parameters (with a maximum of 25), P the number of *seasonal* autoregressive parameters (with a maximum of 3), Q, the number of seasonal moving average parameters (with a maximum of 3) and s, the periodicity of the seasonality (i.e. the number of seasons). The keywords also specify the values of the parameters. For example, in the option "`p-r=2, 1.10, -0.20`", the first entry indicates the number of regular autoregressive parameters and the second and third entries are the values of the two parameters, 1.10 and -0.20.

In the $(p,q)(P,Q)_s$ mathematical notation, the internal default ARMA model is $(1,0)(0,0)_1$ with autoregressive parameter $\phi_1 = 0.999999$. The resulting ARMA model $e_t = 0.999999\, e_{t-1} + v_t$ is virtually equivalent to the "random walk" model. Table 6 summarizes various ARMA options and their internal default values.

Table 6
ARMA Options and Default Values

Keyword	**Entry**	**Description**	**Default Value**
"`p-r`"	see below	Regular autoregressive parameters	"`p-r=1, 0.999999`"
"`q-r`"	see below	Regular moving average parameters	0
"`p-s`"	see below	Seasonal autoregressive parameters	0
"`q-s`"	see below	Seasonal moving average parameters	0
"`n-s`"	numeric	Number of seasons	1
Numeric entry followed by the number of specified parameters, e.g. "`p-r=2, 1.10, -0.20`"			

6. User-supplied Default Options

Users may supply their own default options, by entering a set of options with control series identifier equal to "`default`" (e.g. "`ids=default`"). The default options end with a semi-colon and must precede the first set of options for benchmarking. These options are entered at the beginning of the option file; followed by the specific options, title, control series identifiers and, if applicable, options that replace the default options, for the pairs of series to be benchmarked. An example of an option file using user supplied default options is provided in Table 7.

Table 7
Illustrative Example of an Option File with Default Options

```
ids=default,
ysf=1995, msf=1, ysl=2001, msl=4,
met=0, int=0, cvs=0, cvb=0, cvi=0
bia=0, pls=0, plc=0, sea=1, ind=1;

Options for each series processed:
tit=Manufacturing Production Index: Sector 31,
ids=Sector31, idb=Bench31, idi=Sector31;

tit=Manufacturing Production Index: Sector 32,
ids=Sector32, idb=Bench32, idi=Sector32;

tit=Manufacturing Production Index: Sector 33,
ids=Sector33, idb=Bench33, idi=Sector33;
```

7. Options Producing Denton Models

To produce results of the Proportional Denton Method, dispersion values of the original series must be set to the coefficients of variation option and be constant, benchmarks must be binding, only one estimation interval must be used, and the internal defaults must be used for the other options. Appendix C provides the program setup which produces results based on the Proportional Denton Method.

To produce results of the Additive Denton Method, dispersion values of the original series must be set to the variance option, and the other options are the same as for the Proportional Denton Method.

C. Input Data Files

1. Original Series File

Table 8 displays the file of the original series for the manufacturing production index. According to the format of the file "`(a10,6i5,f12.0,f3.0)`" (on the second line of Table 1), the series identifier occupies the first 10 columns of each record ("`a10`"); the starting year, month and day and the ending year, month and day occupy the next 6 fields of 5 columns ("`6i5`"); the value of the benchmark occupies the next 12 columns ("`f12.0`"), and its dispersion, which in the example is left blank, occupies the next three columns ("`f3.0`").

Table 8
Illustrative Example of the Original Series File

input01	1995	1	1	1995	1	1	108.29
input01	1995	2	2	1995	2	2	121.85
input01	1995	3	3	1995	3	3	126.87
input01	1995	4	4	1995	4	4	120.30
input01	1996	1	1	1996	1	1	107.99
input01	1996	2	2	1996	2	2	122.16
input01	1996	3	3	1996	3	3	125.46
input01	1996	4	4	1996	4	4	124.53
input01	1997	1	1	1997	1	1	116.40
input01	1997	2	2	1997	2	2	130.86
input01	1997	3	3	1997	3	3	135.17
input01	1997	4	4	1997	4	4	123.72

Series Identifier

The maximum length of the series identifier is 20 characters. The series identifiers must be different from one series to the next, because the program detects the end of one series and the start of another series, by the change in the identifiers.

Starting and Ending Years, Months and Days

BENCH requires that each value of a time series be identified by a starting year, month and day and by an ending year, month and day. The starting and ending days are often irrelevant, as in the case of monthly values. In such cases, the starting and ending days *must* be set equal to the starting and ending months respectively. The year, month and (if applicable) day identifiers must be entered as integers, for instance, "`1998 11 21`" means year 1998, month 11 and day 21.

Record order

BENCH requires that the input records be in chronological order. The program performs checks for ascending chronological order, but not for missing records (e.g. a missing day in a daily series) or for duplicate records.

Dispersion Values of Original Series

Depending on the entry for keyword "`cvs=`" in the option file for the series considered, the input dispersion values are either coefficients of variation, standard deviations or variances. The values of the benchmarked series tend to run closer to the original values with relatively lower dispersion. If dispersion values are not entered in the input file; the blank entries are interpreted as 1.0 (e.g. if cvs=0, the coefficient of variation is set to 1.0%).

Maximum Number of Observations

The program allows for 732 original observations and for 190 observations on any estimation interval. This implies that series comprising more than 190 observations must be processed in a moving manner.

Using a spreadsheet to enter data

A simple way to enter the data is with a spreadsheet. Appendix C discusses how to write the file of the original series from Excel.

2. File of Benchmarks

Table 9 presents the file of benchmarks for the manufacturing production index. According to the format of the file `"(a10,6i5,f12.0,f3.0)"` (on the third line of Table 1), the series identifier occupies the first 10 columns of each record ("`a10`"); the starting year, month and day and the ending year, month and day occupy the next 6 fields of 5 columns ("6i5"); the value of the benchmark occupies the next 12 columns ("`f12.0`"), and its dispersion, which is left blank, the next three columns ("`f3.0`").

Table 9
Illustrative Example of the File of Benchmarks

```
bench01     1995    1    1 1995    4    4      120.15
bench01     1996    1    1 1996    4    4      145.68
bench01     1997    1    1 1997    4    4      146.91
```

Series Identifiers

The rules for the identifiers of the original series also apply for the benchmarks, i.e. they must be different from one series to the next. The series identifiers of the benchmarks may differ from those of the original series.

Starting and Ending Years, Months and Days

The same rules as listed for the original series apply. The reference periods of the benchmarks must be embedded in those of the original series. In other words, the periods covered by the benchmarks may not extend beyond the periods covered by the original series. The reference periods specified for each benchmark must exist for the corresponding original series. Consequently, if the reference periods of the original values are described in terms of years, months and days, this must also be the case for the benchmarks. In addition, records must be in chronological order. If one period is covered by more than one benchmark (e.g. by an annual and sub-annual benchmarks), the benchmark with the earliest starting reference periods must come first in the file. For stock series, reference periods of the benchmarks cover only one time period of the original series. If the benchmark is binding (zero dispersion), the benchmarked series will coincide with the original series for that time period.

Dispersion Values of Benchmarks

Depending on the entry for keyword "`cvb=`" for the series considered, the input dispersion values are either coefficients of variation, standard deviations or variances. If dispersion values are not available, the field may be left blank. The resulting entries are interpreted by the program as zero entries (e.g. the coefficient of variation is 0.0%). A benchmark with dispersion equal to zero is binding; that is, the benchmarked series will fully match the benchmark. Two or more benchmarks may cover exactly the same reference periods if they have non-zero dispersion (i.e. if they are non-binding). However, the estimation interval should then be set to cover the whole series. If more than one such benchmark has zero dispersion, a Fortran "run-time error" message will occur as a result of a singular matrix.

Maximum Number of Benchmarks

The program allows for 106 benchmarks and for 42 benchmarks on any estimation interval. This implies that series comprising more than 42 benchmarks must be processed in a moving manner.

D. Log Output File

The log output file "`bench.log`" contains statistics about the run of BENCH. Table 10 presents the Log Output file for the manufacturing production index example.

1. Files Processed and Options Used

The log output file displays a heading, the names and record layout of the files processed (i.e. the contents of file "`bench.fil`"), the options used for each run, the estimation intervals processed with the bias estimate for the interval, the program summary measures and error and warning messages if applicable.

Significance of Bias Parameter

The program displays the estimate of the bias and its calculated standard deviation. A large standard deviation indicates that the bias estimate is not significantly different from zero (or 1.0 in the multiplicative and mixed models) and could be removed from the model.

Table 10
Illustrative Example of the Log Output File

```
                     *** Programme BENCH ***

        to Benchmark, Interpolate and Calendarize Time Series Data

                     by Pierre A. Cholette
              Time Series Research and Analysis Division
                       STATISTICS CANADA
                     Ottawa, Canada, K1A 0T6
                         (613) 951-1601

                          Version 1.00
                    March 30,    1995; 10:00

------------------------------------------------------------------------------
Files and formats in file Bench.Fil:
index01.opt
index01.ori        (a10,6i5,f12.0,f3.0)
index01.ben        (a10,6i5,f12.0,f3.0)
index01.out        (a10,6i5,f12.3,f10.3)
------------------------------------------------------------------------------
                                                              Problem    1

Original series      index01              available from 1995    1    1
                                                    to   2000    4    4

Set of benchmarks    index01              available from 1995    1    1
                                                    to   1996    4    4

  Identifier options:

    tit= Total Manufacturing Production Index

        ids=index01             , idb=index01              ,
        idc=                    , idi=index21              ,
        ida=                    , sea=1,

  Control date options:
        ysf=1995, msf=   1, dsf=   1, ysl=1997, msl=   4, dsl=   4,
        ybf=   0, mbf=   0, dbf=   0, ybl=1996, mbl=   4, dbl=   4,

  Basic options:
        met=   0, ind=   1, int=  42, lin=   0, cvs=   0, cvb=   0,
        cvi=   0, cvc=   0, bia=   0, pls=   0, plc=   0,

  ARMA  options:
        p-r=   1, q-r=   0, p-s=   0, q-s=   0, n-s=   1,
        model: (1 0)(0 0) 1,
        parameters in p q P Q order:  1.000

  WARNING/ERROR: ARMA model may be NON-STATIONNARY. Program may abort

                                       ---------------------------------------
      Additive model            No.    Additive bias
  |-- Estimation interval --|   iter.  estimate and std dev
  1: 1995  1  1 to 1997  4  4    1    .0000000E+00  .0000000E+00

  Average, min. and max. of the proport. discrepancies of the
       original series:              .1110269E+01  .1006893E+01  .1213646E+01
       benchmarked series:           .1000000E+01  .1000000E+01  .1000000E+01

  Average, min. and max. of the additive discrepancies of the
       original series:              .1323375E+02  .8225000E+00  .2564500E+02
       benchmarked series:           .4543921E-10 -.1903935E-09  .2812719E-09

  Avg. abs. change between the original and the benchmarked series
       in period-to-period growth rates:            .2513959E-01
       in period-to-period differences:             .4222243E+01
```

2. Program Summary Measures

The statistics on the discrepancies between the benchmarks and the original series, and on movement preservation, are rather empirical. The summary measures are especially meaningful with methods of the Denton type, which aim at preserving sub-annual movements. They retain usefulness as long as the ARMA process chosen preserves some of the movements from the original series, e.g. any first-order autoregressive processes with positive parameter, with constant variance or constant coefficients of variation.

Statistics on the Discrepancies

The statistics on the discrepancies are displayed with respect to both the original and the benchmarked series. The *average of the discrepancies* measures the level difference between the benchmarks and the original series, or between the benchmarks and the benchmarked series. In the latter case, the discrepancies are actually residual discrepancies, which are null in case of binding benchmarks. Benchmarking with the Denton methods *may* be successful despite very large discrepancies with respect to the original series, because two series with different frequencies may display perfectly compatible movements but very different levels.

The *minimum* and the *maximum of the discrepancies* measure the dispersion of the discrepancies. A low dispersion thus indicates that benchmarking with the Denton methods is probably successful. The occurrence of scattered, i.e. erratic, discrepancies implies that in the process of satisfying the benchmarks, benchmarking distorts the movement of the original series. The reason is that benchmarking consists of distributing these discrepancies over the original series. Scattered discrepancies may mean one of the following:

(1) Some of the benchmarks are not reliable and should be specified as non-binding.

(2) The super-annual (e.g. trend-cyclical) movement of the original series is not reliable. If the benchmarks are reliable and binding, the benchmarked series would incorporate the super-annual movement of the benchmarks, thus producing an improvement over the original.

(3) Both the benchmarks and the original series are not reliable. In this case, the resulting benchmarked series will be an optimal combination of the information available at all frequencies (if the appropriate variances are specified for each annual and sub-annual observation).

Statistics on Movement Preservation

The information provided by the discrepancies is reflected by the *average absolute change in movement* between the original and the benchmarked series. The two following statistics are calculated:

$$c_m = \sum_{t=2}^{T} \left| [(\hat{b}_t/\hat{b}_{t-1}) \ / \ (s_t/s_{t-1})] \ - \ 1.0 \right| \ / \ (T-1)$$

$$c_a = \sum_{t=2}^{T} \left| \ (\hat{b}_t - \hat{b}_{t-1}) \ - \ (s_t - s_{t-1}) \right| \ / \ (T-1)$$

The first statistic, c_m, measures the change in the period-to-period growth rates and the second statistic, c_a, the change in the period-to-period differences of the benchmarked series versus the indicator series. Statistic c_m is, therefore, more relevant to multiplicative and proportional benchmarking, and statistic c_a to additive benchmarking. High values for these statistics correspond to erratic discrepancies and low values to relatively constant discrepancies. Low values mean that the original series does not have to be distorted much to satisfy the benchmarks (if binding). In other words, the movements of the benchmarks are consistent with those in the original series.

3. Error Messages

If some of the values of the original series or the benchmarks are negative or equal to zero and the coefficient of variation option is used ("`cvs=0`"), the program prints an error message and stops.

When the search option is set to 1, the program will end with the error message "no series identifier supplied for search of original series", because it tries to read the next set of option values from the option file. This error message should thus be ignored.

When the default ARMA model is used, the message "ARMA model may be non-stationary" is printed in the log output file. This warning message may be ignored.

The error messages do not anticipate all potential errors. An error message, for example, may be the result of a previous detected or undetected error.

E. Output Data File

1. The Benchmarked Series

In the example of the manufacturing production index, format statement "`(a10,6i5, f12.3,f10.3)`" (on line 4 of Table 1) causes BENCH to write the series identifier in columns 1 to 10 (item "`a10`" in the format); the starting year, month and day and the ending year, month and day, in the following 6 fields of 5 columns ("`6i5`"); the benchmarked value, in the following field of 12 columns with 3 decimals ("`f12.3`"); and the dispersion value, in the following field of ten columns with 3 decimals ("`f10.3`"). In the example, the dispersion values are coefficients of variation. Table 11 provides an example of the benchmarked series file.

Table 11
Illustrative Example of Benchmarked Series File

output01	1995	1	1	1995	1	1	104.099	.004
output01	1995	2	2	1995	2	2	119.188	.003
output01	1995	3	3	1995	3	3	128.644	.003
output01	1995	4	4	1995	4	4	128.668	.003
output01	1996	1	1	1996	1	1	123.526	.003
output01	1996	2	2	1996	2	2	146.770	.002
output01	1996	3	3	1996	3	3	155.589	.002
output01	1996	4	4	1996	4	4	156.835	.003
output01	1997	1	1	1997	1	1	146.596	.005
output01	1997	2	2	1997	2	2	164.806	.006
output01	1997	3	3	1997	3	3	170.234	.007
output01	1997	4	4	1997	4	4	155.814	.008

2. Graphs of the Benchmarked Series

It is recommended to use graphs to evaluate results of benchmarking the time series. One can have, for example, a graph which displays the original series, the benchmarks and the benchmarked series (as in Figure 1 above). An easy way to obtain these graphs is by using a spreadsheet program such as Excel (see Appendix C for instructions on how to enter the benchmarked series in Excel). Another useful graph would show the benchmark to indicator ratio (as in Figure 3).

IV. SPECIAL TOPICS

This section discusses three practical issues that are likely to be encountered in the course of benchmarking various series at BPS: what to do when new benchmarks become available, what to do when variables to be benchmarked are negative (or zero), and how to extrapolate data for the most current period in the absence of a benchmark.

A. Data Revisions

One of the advantages of the Denton methods is that they allow for revisions to as many preceding years as desired. However, to avoid introducing significant distortions to the benchmarked series, at least two to three preceding years should be benchmarked each time new annual data become available. In general, the impact of new benchmarks on more distant years will be negligible.

B. Negative or zero values

The Proportional Denton Method requires that the indicator series consist of positive values only. For series that contain zeroes but not negative values, this problem can be circumvented by replacing the zeroes with values infinitesimally close to zero. For a series that can take both negative and positive values, and is derived as the differences between two nonnegative series (such as changes in inventories, for example), the problem can be avoided by applying the Proportional Denton Method to the opening and closing inventory *levels* rather than to their *changes*. Alternatively, one can temporarily convert the indicator into a series containing only positive values by adding a sufficiently large constant to all periods, benchmarking the resulting indicator, and subsequently deducting the constant from the resulting estimates.

C. Extrapolating the Benchmarked Series

The annual benchmark of a given year usually becomes available several months after that year is over. Thus there is typically no benchmark for the most recent sub-annual values. The expression “preliminary benchmarking” can be used to refer to the adjustment made to the current sub-annual observations. “Preliminary benchmarking” should be such that the revisions of the initial benchmarked values, when the benchmark becomes available, are minimal. How can that be done? The Proportional Denton Method implicitly “forecasts” the next annual Benchmark to Indicator (BI) ratio as equal to the sub-annual ratio for the last sub-annual period of the last benchmark year. It may be possible to improve the estimates for the extrapolated benchmarked series by incorporating information on past systematic movements in the annual BI ratio. Note that only the annual BI ratio has to be forecast. This value is then used to obtain an estimate of the benchmark for the next year by multiplying with the annual average (sum) of the indicator series for that year. Once an estimate of the benchmark for the next year is available, the Proportional Denton Method can then be run a second time with the extrapolated benchmark added to the series of benchmarks.

APPENDIX A
ESTIMATION OF ADDITIVE BENCHMARKING MODEL[4]

The two equations (1a) and (1b) for the additive benchmarking model can be written in matrix algebra as:

$$\boldsymbol{s} \;=\; \boldsymbol{\imath}\, a + \boldsymbol{I}_T\, \boldsymbol{b} + \boldsymbol{e}, \qquad \mathscr{E}(\boldsymbol{e}) = \boldsymbol{0}, \quad \mathscr{E}(\boldsymbol{e}\,\boldsymbol{e}') = \boldsymbol{V}_e \tag{A.1}$$

$$\boldsymbol{y} \;=\; \boldsymbol{J}\, \boldsymbol{b} + \boldsymbol{w}, \qquad \mathscr{E}(\boldsymbol{w}) = \boldsymbol{0}, \quad \mathscr{E}(\boldsymbol{w}\,\boldsymbol{w}') = \boldsymbol{V}_w \tag{A.2}$$

where

$\boldsymbol{s}$ is the T by 1 vector of the sub-annual indicator series,
$\boldsymbol{y}$ is the M by 1 vector of the annual benchmarks,
$\boldsymbol{i}$ is a T by 1 vector of ones,
$\boldsymbol{a}$ is a scalar which represents the bias,
$\boldsymbol{I}_T$ is a T by T identity matrix,
$\boldsymbol{b}$ is the T by 1 vector of the monthly (quarterly) series of benchmarked data, and
$\boldsymbol{J}$ is a M by T matrix with the following elements:

$$\boldsymbol{J} = \left[j_{m,\,t} \,/\, p_m = \begin{cases} 1, & t \in m, \\ 0, & t \notin m, \end{cases} \right] \tag{A.3}$$

where p_m is equal to 1 for flow and stock series and equal to the number of periods covered by benchmark y_m for index series,

T is the number of sub-annual periods for which the indicator series is available,
M is the number of years for which benchmark information is available.

Equations (A.1) and (A.2) can be written as a single equation

$$\begin{bmatrix} \boldsymbol{s} \\ \boldsymbol{y} \end{bmatrix} = \begin{bmatrix} \boldsymbol{\imath} & \boldsymbol{I}_T \\ \boldsymbol{0} & \boldsymbol{J} \end{bmatrix} \begin{bmatrix} a \\ \boldsymbol{b} \end{bmatrix} + \begin{bmatrix} \boldsymbol{e} \\ \boldsymbol{w} \end{bmatrix}$$

or

$$\boldsymbol{Y} = \boldsymbol{X}\,\boldsymbol{\beta} + \boldsymbol{u}, \tag{A.4}$$

$$\mathscr{E}(\boldsymbol{u}) = \boldsymbol{0}, \quad \mathscr{E}(\boldsymbol{u}\,\boldsymbol{u}') = \boldsymbol{V} = \begin{bmatrix} \boldsymbol{V}_e & \boldsymbol{0} \\ \boldsymbol{0} & \boldsymbol{V}_w \end{bmatrix}$$

where $\boldsymbol{Y}$, $\boldsymbol{X}$, $\boldsymbol{\beta}$ and $\boldsymbol{u}$ are defined implicitly.

The Generalized Least Squares solution of model (A.4) is

$$\hat{\boldsymbol{\beta}} = \begin{bmatrix} \hat{a} \\ \hat{\boldsymbol{b}} \end{bmatrix} = (\boldsymbol{X}'\boldsymbol{V}^{-1}\boldsymbol{X})^{-1}\, \boldsymbol{X}'\boldsymbol{V}^{-1}\boldsymbol{Y} \tag{A.5}$$

$$cov(\hat{\boldsymbol{\beta}}) = (\boldsymbol{X}'\boldsymbol{V}^{-1}\boldsymbol{X})^{-1} = \begin{bmatrix} v_a & \boldsymbol{v}_{ab} \\ \boldsymbol{v}_{ba} & \boldsymbol{V}_b \end{bmatrix}$$

[4] This appendix is based on Pierre A. Cholette, *op. cit.*, p. 41

Defining

$$\boldsymbol{Q} = (\boldsymbol{J}\,\boldsymbol{V}_e\,\boldsymbol{J}' + \boldsymbol{V}_w)^{-1}, \tag{A.6}$$

it can be shown that

$$v_a = 1 \,/\, (\boldsymbol{\iota}'\boldsymbol{J}'\boldsymbol{Q}\,\boldsymbol{J}\,\boldsymbol{\iota}) \tag{A.7}$$

$$\boldsymbol{v}_{ba} = \boldsymbol{v}_{ab}' = -(\boldsymbol{I}_T - \boldsymbol{V}_e\boldsymbol{J}'\boldsymbol{Q}\,\boldsymbol{J})\,\boldsymbol{\iota}v_a \tag{A.8}$$

$$\boldsymbol{V}_b = (\boldsymbol{V}_e - \boldsymbol{V}_e\boldsymbol{J}'\boldsymbol{Q}\,\boldsymbol{J}\boldsymbol{V}_e) + (\boldsymbol{I}_T - \boldsymbol{V}_e\boldsymbol{J}'\boldsymbol{Q}\,\boldsymbol{J})\,\boldsymbol{\iota}v_a\boldsymbol{\iota}'(\boldsymbol{I}_T - \boldsymbol{V}_e\boldsymbol{J}'\boldsymbol{Q}\,\boldsymbol{J})' \tag{A.9}$$

$$\hat{a} = -\,v_a\,\boldsymbol{\iota}'\boldsymbol{J}'\,\boldsymbol{Q}\,(\boldsymbol{y} - \boldsymbol{J}\boldsymbol{s}) \tag{A.10}$$

$$\hat{\boldsymbol{b}} = \boldsymbol{s}^* + \boldsymbol{V}_e\boldsymbol{J}'\,\boldsymbol{Q}\,(\boldsymbol{y} - \boldsymbol{J}\boldsymbol{s}^*), \qquad \boldsymbol{s}^* = \boldsymbol{s} - \boldsymbol{\iota}\hat{a} \tag{A.11}$$

where $\boldsymbol{s}^*$ contains the sub-annual observations corrected for the estimated bias.

For the Proportional Denton Method:

1) the bias is set to zero,
2) the constraints on the benchmarks are binding, and therefore $\mathbf{V}_w$ is zero, and.
3) $\mathbf{V}_e$ follows an (1,0)(0,0) ARMA model with = 0.999999.

Thus, for the Proportional Denton Method benchmarking model equations (A.6) to (A.11) can be simplified to:

$$\boldsymbol{Q} = (\boldsymbol{J}\,\boldsymbol{V}_e\boldsymbol{J}')^{-1} \tag{A.12}$$

$$\hat{\boldsymbol{b}} = \boldsymbol{s} + \boldsymbol{V}_e\boldsymbol{J}'\,\boldsymbol{Q}\,(\boldsymbol{y} - \boldsymbol{J}\boldsymbol{s}) \tag{A.13}$$

and

$$\boldsymbol{V}_b = (\boldsymbol{V}_e - \boldsymbol{V}_e\boldsymbol{J}'\boldsymbol{Q}\,\boldsymbol{J}\boldsymbol{V}_e) \tag{A.14}$$

APPENDIX B
ESTIMATION OF PROPORTIONAL DENTON MODEL USING EXCEL

This Appendix presents the calculations in Excel according to the Proportional Denton Method. The calculations use equations (A.12) to (A.14) of Appendix A. These results are the same as those produced by the BENCH program (Table 11), excluding the projections for the year 1997. The input data for the sub-annual indicator series is taken from Table 8 and the data for the benchmarks from Table 9. They are provided here so that the reader would be able to trace the calculations step by step to enhance his/her understanding of the methodology. The Proportional Denton Method in Excel uses a macro programmed in Visual Basic for Applications (VBA).

The series of original data $\boldsymbol{s}$ has the following observations:

$$\boldsymbol{s} = \begin{bmatrix} 108.29 \\ 121.85 \\ 126.87 \\ 120.30 \\ 107.99 \\ 122.16 \\ 125.46 \\ 124.53 \end{bmatrix}$$

The series of benchmarks $\boldsymbol{y}$ consists of data for two years:

$$\boldsymbol{y} = \begin{bmatrix} 120.15 \\ 145.68 \end{bmatrix}$$

Because the example uses a quarterly index series we have:

$$\mathbf{p_m} = \begin{bmatrix} 4.00 \end{bmatrix},$$

$$\boldsymbol{J} = \begin{bmatrix} 0.25 & 0.25 & 0.25 & 0.25 & 0.00 & 0.00 & 0.00 & 0.00 \\ 0.00 & 0.00 & 0.00 & 0.00 & 0.25 & 0.25 & 0.25 & 0.25 \end{bmatrix}$$

and thus

$$\boldsymbol{y} - \boldsymbol{Js} = \begin{bmatrix} 0.8225 \\ 25.645 \end{bmatrix}$$

Matrix $\boldsymbol{V_e}$ is obtained as $\boldsymbol{V_e} = \text{diag}(\boldsymbol{s}) * \boldsymbol{W} * \text{diag}(\boldsymbol{s})$:

$$
V_e = \begin{bmatrix}
11,726.7 & 13,195.1 & 13,738.7 & 13,027.2 & 11,694.2 & 13,228.6 & 13,586.0 & 13,485.3 \\
13,195.1 & 14,847.4 & 15,459.1 & 14,658.5 & 13,158.5 & 14,885.1 & 15,287.2 & 15,173.9 \\
13,738.7 & 15,459.1 & 16,096.0 & 15,262.4 & 13,700.7 & 15,498.4 & 15,917.0 & 15,799.0 \\
13,027.2 & 14,658.5 & 15,262.4 & 14,472.1 & 12,991.2 & 14,695.8 & 15,092.8 & 14,980.9 \\
11,694.2 & 13,158.5 & 13,700.7 & 12,991.2 & 11,661.8 & 13,192.0 & 13,548.4 & 13,448.0 \\
13,228.6 & 14,885.1 & 15,498.4 & 14,695.8 & 13,192.0 & 14,923.1 & 15,326.2 & 15,212.6 \\
13,586.0 & 15,287.2 & 15,917.0 & 15,092.8 & 13,548.4 & 15,326.2 & 15,740.2 & 15,623.5 \\
13,485.3 & 15,173.9 & 15,799.0 & 14,980.9 & 13,448.0 & 15,212.6 & 15,623.5 & 15,507.7
\end{bmatrix}
$$

where $\boldsymbol{W}$ is obtained by applying the default ARMA model with =0.999999, i.e.:

$$
W = \begin{bmatrix}
1.000000 & 0.999999 & 0.999998 & 0.999997 & 0.999996 & 0.999995 & 0.999994 & 0.999993 \\
0.999999 & 1.000000 & 0.999999 & 0.999998 & 0.999997 & 0.999996 & 0.999995 & 0.999994 \\
0.999998 & 0.999999 & 1.000000 & 0.999999 & 0.999998 & 0.999997 & 0.999996 & 0.999995 \\
0.999997 & 0.999998 & 0.999999 & 1.000000 & 0.999999 & 0.999998 & 0.999997 & 0.999996 \\
0.999996 & 0.999997 & 0.999998 & 0.999999 & 1.000000 & 0.999999 & 0.999998 & 0.999997 \\
0.999995 & 0.999996 & 0.999997 & 0.999998 & 0.999999 & 1.000000 & 0.999999 & 0.999998 \\
0.999994 & 0.999995 & 0.999996 & 0.999997 & 0.999998 & 0.999999 & 1.000000 & 0.999999 \\
0.999993 & 0.999994 & 0.999995 & 0.999996 & 0.999997 & 0.999998 & 0.999999 & 1.000000
\end{bmatrix}
$$

The intermediate matrix Q is obtained by taking the inverse of $\boldsymbol{J V_e J'}$

$$
J V_e J' = \begin{bmatrix} 14,239.0 & 14,323.4 \\ 14,323.4 & 14408.4 \end{bmatrix}
$$

$$
Q = \begin{bmatrix} 12.6198 & -12.5454 \\ -12.5454 & 12.4715 \end{bmatrix}
$$

The benchmarked series is then obtained using equation (A.13) as:

$$
\hat{b} = \begin{bmatrix} 104.099 \\ 119.188 \\ 128.644 \\ 128.668 \\ 123.526 \\ 146.770 \\ 155.589 \\ 156.835 \end{bmatrix}
$$

APPENDIX C
SUMMARY OF INSTRUCTIONS FOR BENCH

The following steps are required to prepare the instruction and data files for benchmarking a pair of time series with the Proportional Denton Method using the BENCH program.

The example uses monthly index numbers and annual benchmarks. The filename used in the example is "test01".

1) Prepare a spreadsheet with the following columns for the "indicator" series - starting with cell A1

		length:	**example:**
col. 1	Variable name (enter left justified)	10	index01
col. 2	Starting reference year for the observation	5	1997
col. 3	Starting reference month for the observation	5	1
col. 4	Starting reference month for the observation (repeated)	5	1
col. 5	Ending reference year for the observation	5	1997
col. 6	Ending reference month for the observation	5	1
col. 7	Ending reference month for the observation (repeated)	5	1
col. 8	Value for the observation	12	25.750

The data in columns 2 to 8 is entered right justified. It is illegal to use separators for thousands.

Save this worksheet with the file name "data1", using as the type "Formatted Text (Space delimited)". The extension is "prn". The format of the data should be (A10,6I5,F12.0)

Multiple sets of "indicator" series may be entered in the same file. They are identified with their "variable name".

2) Rename file "data1.prn" to "test01.ori"

3) Prepare a spreadsheet with the following columns for the "benchmark" series - starting with cell A1

		length:	**example:**
col. 1	Variable name (enter left justified)	10	bench01
col. 2	Starting reference year for the observation	5	1997
col. 3	Starting reference month for the observation	5	1
col. 4	Starting reference month for the observation (repeated)	5	1
col. 5	Ending reference year for the observation	5	1997
col. 6	Ending reference month for the observation	5	12
col. 7	Ending reference month for the observation (repeated)	5	12
col. 8	Value for the observation	12	1250.00

The data in columns 2 to 8 is entered right justified. It is illegal to use separators for thousands.

Save this worksheet with the file name "data2", using as the type "Formatted Text (Space delimited)". The extension is "prn". The format of the data should be (A10,6I5,F12.0)

Multiple sets of "benchmark" series may be entered in the same file. They are identified with their "variable name".

4) Rename file "data2.prn" to "test01.ben"

5) Prepare the Bench Option file. Its name must be "test01.opt".

The following option indicators are defined:

	Identifier Options:	**default:**	**example:**
tit	the title	blank	Example
ids	the label used for the indicator series	n/a	index01
idb	the label used for the series of benchmarks	ids	bench01
idi	the label to be used for the output series	ids	series01
	Control Date Options:	**default:**	**example:**
ysf	starting year for the indicator series	n/a	1995
msf	starting month (or quarter) for the indicator series	n/a	1
ysl	last year for the indicator series	n/a	2001
msl	last month (or quarter) for the indicator series	n/a	12
ybf	starting year for the benchmark series	ysf	
mbf	starting month (or quarter) for the benchmark series	msf	
ybl	last year for the benchmark series	ysl	
mbl	last month (or quarter) for the benchmark series	msl	
	Basic Options:	**default:**	**example:**
ind	0: a flow series or a stock series; 1: an index series	0	1
met	model used (0: additive, 1: mixed and 2: multiplicative)	0	
pls	plot of the original series (0: no plot and 1: plot)	0	
plc	plot of the discrepancies (0: no plot and 1: plot)	1	0
sea	search command (0: files read consecutively and 1: matching their labels with the control identifiers)	0	1
cvs	measure of dispersion of the original series (0: coefficient of variation, 1: standard deviation, 2: variance)	0	
cvb	measure of dispersion of the benchmarks (0: coefficient of variation, 1: standard deviation, 2: variance)	0	
int	number of benchmark intervals used in moving estimation	5	0

Option indicators are separated by commas. The last option entered is followed by a semi-colon.

The option file for this example is listed below.

Example for file "test01.opt"

```
tit= Example series 1,
ids=index01, idb=bench01, idi=series01,
ysf=1995,  msf=1,  ysl=2001,  msl=12,
int=0, sea=1, plc=0, ind=1;
```

When the Bench program is run on multiple data sets the options common to each data set may be entered as default options following option "ids=default" at the start of the option file. An example in which two series are adjusted follows.

Example for file "test02.opt"

```
ids=default,
ysf=1995,  msf=1,  ysl=2001,  msl=12,
int=0, sea=1, plc=0; ind=1;
  Options for pairs of data sets:
tit= Example series 1,
ids=index01, idb=bench01, idi=series01;
tit= Example series 2,
ids=index02, idb=bench02, idi=series02;
```

6) Prepare file "bench.fil". In this file the filenames and the formats used for data entry are entered. The file names start in column 1. The formats are entered following the file name.

Example for file "bench.fil"

```
test01.opt
test01.ori          (A10,6I5,F12.0,F5.0)
test01.ben          (A10,6I5,F12.0,F5.0)
test01.out          (A10,6I5,F12.3,F5.3)
```

File "bench.fil" must be present in the current directory. The second floating point format (F5.0 and F5.3) is used, if applicable, for the measures of dispersion.

7) File "bench.exe" must be present in the current directory. The program is run by executing this file in MS-DOS from the current directory.

For example, if the directory with the bench files is "c:\bench", then

a) enter MS-DOS
b) type "cd.." to go to the root directory of drive C
c) type "cd bench" to go to directory c:\bench
d) type "bench" at the MS-DOS prompt to execute the program

Note that the name of directories may not contain blanks under MS-DOS

8) The system output from running program Bench is entered in the current directory as file "bench.log". This file gives summary measures for the benchmarked series and (if applicable) error messages.

9) File "test01.out" will hold the resulting benchmarked series. The data is entered as a text file using the format for "test01.out" in "bench.fil". This file is entered into Excel with the "Text Import Wizard" using the fixed length option (the default) in step 1.

APPENDIX D
GLOSSARY OF MAIN TERMS

ARMA model	Auto Regressive Moving Average model.
Benchmark	the series of less frequent data, which is considered more reliable.
Benchmarked series	the resultant series from benchmarking.
Benchmarking	the procedure for combining a series of high-frequency data (the indicator series) with a series of less frequent data (the benchmarks) for a certain variable into a consistent time series.
BI ratio	benchmark to indicator ratio.
Binding benchmark	A benchmark with dispersion value equal to zero; that is, the benchmarked series will fully match the benchmark.
Coefficient of variation	the standard deviation of the observation divided by the value of the observation.
Control series identifier	an alphanumeric entry to identify the values of the input and output data files.
Dispersion value	A measure of the reliability of an observation, measured by its variance, standard deviation or coefficient of variation.
Flow variable	variable measured by summing over a reference period, e.g. sales per month.
Index variable	variable measured as an average over a reference period, e.g. the index of industrial production.
Indicator series	the series to be benchmarked, used interchangeably with “original series”.
Interpolation	similar to benchmarking, but the indicator series is not directly related to the series of benchmarks.
Non-binding benchmark	A benchmark with a positive dispersion value; that is, the benchmarked series will not exactly match the benchmark.
Original series	the series to be benchmarked.
Proportional Denton Method	benchmarking method which preserves the growth rate of the original series in an optimal manner.
Reference period	set of consecutive months covered by a data point, e.g. April 1, 2000 to June 30, 2000.
Stock variable	variable measured as of a particular date, e.g. inventories.

BENCHMARKING SUSENAS HEALTH AND EDUCATION DATA

Report # 69
Statistical Paper # 17

by
Yahya Jammal
Wendy Hartanto

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TABLE OF CONTENTS

I. INTRODUCTION

BPS has been collecting data on different types of household expenditure using the Susenas surveys since the 1960s. With increasing demand from users for more detailed information, BPS began to conduct in the 1980s infrequent but more specialized surveys on particular characteristics, including expenditure. Despite the abundance of data in Susenas involving rupiah expenditure, its publications were limited to tabulations of expenditure shares rather than levels. One reason for the reluctance to publish expenditure levels was the need to avoid confusing users: when different levels for the same variable are produced for the same year, users may question the reliability of the whole methodology.

In the past two years, BPS has used a methodology which creates a consistent data set from two different data sources for the same variable, a methodology referred to as benchmarking. Essentially, benchmarking creates a set of adjusted data that incorporates *levels* from one less frequent source while preserving, as much as possible, *changes* or fluctuations from the other more frequent source.

BPS has already used the methodology successfully to ensure consistency between the monthly/quarterly manufacturing production surveys and the more complete annual manufacturing surveys and has provided preliminary results in a separate publication.[1] In the past year, BPS has also been working on a statistical revision of the historical GDP series by benchmarking the 43 sub-sectoral production accounts to their corresponding levels in the 1990, 1995 and 2000 levels obtained from the more complete Input-Output tables.

An additional area in which benchmarking holds the promise of substantial benefits to users is that of Susenas data. The present report applies this methodology to two variables: expenditure on education and expenditure on health. The hope is that this would set the stage for further application to other variables in Susenas which may be of interest to users.

II. METHODOLOGY

A. SUSENAS Survey Description

Susenas is a multi-purpose household survey which has been conducted regularly since the 1960s and has constituted the primary source for data on socio-economic characteristics of the population in Indonesia. Its frequency, coverage and questionnaires have undertaken

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1 *Benchmark Production and Employment Indices of Large and Medium Manufacturing: 1993 - 2000*, October, 2001.

several changes over time. A comprehensive description of the development of this survey, including design, management, tabulations and dissemination through 1996 is documented in a 1997 BPS publication.[2] In this report, we will not attempt to duplicate the contents of that publication. Rather, we will briefly describe major characteristics of the survey which are relevant to the subject of this report and material changes, if any, to what was described in the earlier publication.

Since the 1990s Susenas has been divided into two major undertakings: an annual *core* survey designed to track developments in major household characteristics and a tri-annual *module* designed to measure in more detail specific household characteristics. Three *module* surveys have been conducted in the past decade:

- one on household income and expenditure,
- one on culture, criminality, tourism and welfare and
- one on health, education and housing

In order to spread workload more evenly, each *module* has been conducted once every three years. Thus, in any one year two surveys have typically been conducted at the same time: a *core* survey and one of the *modules*. This has been the general pattern over the past decade. Actual implementation may have differed slightly from year to year depending on policy priorities and budget considerations.[3]

1. ***Core***

The *core* survey is generally designed to provide adequate representation of the major household characteristics at the kabupaten level. Thus it has a less detailed questionnaire but covers a large number of households (about 200,000 households since 1993). It is typically conducted in the month of February every year and requires an interview between a BPS enumerator (the *mantri statistik*) and the head of the household.[4] During the interview, the enumerator would ask questions as stated in the questionnaire (Appendix A provides the relevant pages of a typical questionnaire) and would record the answers. Questions generally

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2 Surbakti, Pajung, *Indonesia's National Socio-Economic Survey: A Continual Data Source for Analysis on Welfare Development*, Central Bureau of Statistics, 1997.

3 For example, starting in 2000, education was split from health and housing and added to the second *module* survey.

4 If the head of the household is not present at the time of the interview, then any adult household member (excluding servants) who is knowledgeable about the household could answer.

require answers covering the previous month (*sebulan yang lalu*) and the previous year (*12 bulan yang lalu*).[5] Questions on health and education expenditure are limited to two:

- "What were the household's expenditure on education (registration, tuition, boy/girl scouts, extra-curricular activities and others?" (*Pengeluaran biaya pendidikan --uang pendaftaran, SPP, POMG/BP3, uang pangkal/daftar ulang, pramuka, prakarya, kursus dan lainnya*).[6]

- "What were the household's expenditure on health (hospitalization, family planning, medical doctors, witch doctors, medicines and others?" (*Pengeluaran biaya kesehatan --rumah sakit, puskesmas, dokter praktek, dukun, obat-obatan, dan lainnya*).[7]

To each question the respondent is expected to provide a rupiah figure for total expenditure in the month and year preceding the interview.

Field work is conducted more or less evenly throughout the month of February. Data entry is then undertaken by the BPS regional offices: provincial offices decide on whether the activity should be conducted by their local kabupaten offices or centrally in the provincial office. Data files and original questionnaires are then sent to the BPS Head Office for cleaning and tabulation, a process which normally takes place between the months of June and August, before results are finally published in November of that year.

2. *Module*

The *module* survey is generally designed to provide adequate representation of detailed household characteristics at the national level. Thus it has a detailed questionnaire but covers a smaller number of households (about 65,000 households since 1992). Like the *core* survey, it is typically conducted in the month of February and requires an interview between a BPS enumerator and the head of the household. Unlike the *core* survey, which requires answers covering the household as a unit (for health and education questions), the *module* survey requires answers covering individual household members. Also unlike the *core* survey, for which the questionnaire contents have been more or less the same every year, questionnaires for the health

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[5] The operational guidelines give the respondent a choice between the calendar month (year) or the previous month (12 months) from the date of the interview. Thus responses from households may not necessarily cover consistently the same calendar period.

[6] Question VII.B.19 in the questionnaire in Appendix A.

[7] Question VII.B.20 in the questionnaire in Appendix A.

and education *module* surveys have undergone several changes, some significant. In what follows we will briefly describe the main features of each one of the surveys since 1992.

First, the education *module*:

- in 1992, both health and education were covered in the same survey. For education, besides the main characteristics of household members (e.g. level of schooling, reason for dropping out, reason for not attending school, field of study, average daily school time etc.), the household was required to report for every eligible household member the rupiah expenditure in the previous week and in the previous month for every one of the following fees and charges (relevant pages of the questionnaire are provided in Appendix B):[8]

    a. Registration (*uang pendaftaran*)
    b. Tuition (*iuran-iuran*), which in turn is divided into fourteen components
    c. Examination (*evaluasi*), divided into eight components
    d. School uniforms (*seragam sekolah*), divided into three components
    e. Athletic material (*seragam olah raga*), divided into three components
    f. Books and stationery (*buku, alat tulis dan sejenisnya*), divided into three components
    g. Other (*Lain-lain*), divided into two components
    h. Transportation (*transportasi*)
    i. Snacks (*uang saku*)
    j. Courses (*kursus-kursus*)
    k. Other (*lainnya*)

    Thus, a total of thirty-eight types of expenditure were included.

- in 1995, both health and education were also covered in the same survey. For education, the number of types of fees was cut to thirteen (from thirty-eight) consolidated into the following categories (relevant pages of the questionnaire are provided in Appendix C):[9]

    a. Registration (*pendaftaran*)
    b. Tuition (*iuran*), which in turn is divided into five components

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8 Questions VII.I through VII.III in the questionnaire in Appendix B.

9 Questions VII.I through VII.IV in the questionnaire in Appendix C.

c. Examination (*evaluasi/ujian*)
d. Study material (*bahan penunjang mata pelajaran*)
e. Uniforms (*seragam sekolah & olah raga*)
f. Books and stationery (*buku, alat tulis dan perlengkapan bersekolah*), divided into two components
g. Transportation (*transportasi*)
h. Extra-curricular activities (*kursus sehubungan dengan sekolah*)
i. Other (*lainnya*)

In addition, the household was required to report for every eligible household member expenditure in the previous month and in the previous year. Reporting for the previous week, used in 1992, was dropped.

- in 1998, although the *module* covered both education and health, separate questionnaires were used for the two topics. The reason for the separate questionnaire, according to knowledgeable officials involved in the design of that survey, was the greater detail included in the health questionnaire for the first time. For education, although the same questions were asked as in the 1995 questionnaire, the household was required to provide figures for the previous month and for the period between July and December of the previous year, not for twelve months, as in 1995 (relevant pages of the questionnaire are provided in Appendix D).

- in 2000, education was separated from health and added to the *module* covering culture. Two major changes were introduced to the earlier questions on education:

  a. First, the household was no longer required to report on expenditure in the previous month. Only expenditure for the July-December 1999 period were required.

  b. The breakdown of individual components underwent a slight modification in formatting but not in substance.[10]

  (relevant pages of the questionnaire are provided in Appendix F).

The Health *module* underwent the following changes:

- in 1992, besides the main characteristics of household members (whether sick, type of sickness, use of medicines etc.), the household was required to report for every eligible household

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[10] Question VII.35 in the questionnaire in Appendix F.

member the rupiah expenditure in the previous month on five items (relevant pages of the questionnaire are provided in Appendix B):[11]

a. Cost of outpatient care (*rawat jalan*): this was divided into two components (expenses from own sources and those from other sources)

b. Cost of inpatient care (*rawat inap*): this was also divided into the two sources of funds as in a.

c. Cost of medicines (*biaya pembelian obat-obatan ringan dan vitamin*)

d. Maternity expenses (*biaya persalinan*): this was also divided into the two sources of funds as in a.

e. Current pregnancy expenses (*biaya pengobatan dan pemeriksaan yang dikeluarkan untuk kehamilan sekarang*): also divided into the two sources of funds as in a.

- in 1995, the questions were consolidated into two (relevant pages of the questionnaire are provided in Appendix C):[12]

  a. Cost of outpatient care (*rawat jalan*), including medications.

  b. Cost of inpatient care (*rawat inap*), including medications.

  Like the 1992 questionnaire, households were required to provide expenditure data only in the previous month.

- in 1998, a far more detailed questionnaire than in the past was designed. Major changes were introduced to the earlier questions. Reporting, by eligible household member and applicable to the previous month, was required for the following questions (relevant pages of the questionnaire are provided in Appendix E):

  a. Cost of personal medicines purchased (*biaya mengobati sendiri*).[13]

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[11] Questions V.4, V.5, V.6, V.15 and V.17 in the questionnaire in Appendix B.

[12] Questions V.3 and V.6 in the questionnaire in Appendix C.

[13] Questions V.1 and V.2 in the questionnaire in Appendix E.

b. Cost of outpatient care (*biaya berobat jalan*): the household was required to provide detailed figures about the place in which they were spent (government hospital, private hospital, private physician, family planning center etc.) during the previous month. They were also required to differentiate between expenditure paid directly by the household and their estimate of the total cost (including, for example, those paid by insurance companies, the government or relatives outside the household).[14] In addition, a further question was asked about the total estimated amount paid during the previous month on regular consultations not related to a particular illness (*konsultasi/pemeriksaan kesehatan, kir kesehatan, periksa hamil, periksa bayi*, Question V.8).

c. Cost of hospitalization/in-patient care (*biaya rawat inap*): the household was required to provide detailed figures about the place in which they were spent (government hospital, private hospital, maternity etc.) during the previous year. Here again, they were required to differentiate between direct expenditure from household sources and their estimate of the total cost.[15]

- in 2001 the health *module* questions generally undertook a slight formatting, but not substantive, modification (see Appendix G for relevant pages of the questionnaire). The only exception was the explicit requirement that the detailed expenditure categories refer to payments made solely from the household's own sources.

3. Conclusion

To summarize the main findings of the above sections:

- The *core* survey covers far more households than the *module* (200,000 vs 65,000). Consequently, the sampling error in the former is expected to be lower than that in the latter. However,

- the *module* survey involves a far more elaborate set of questions (by individual household member and including several components for every variable measured), a methodology

14 Question V.6 in the questionnaire in Appendix E.

15 Question V.11 in the questionnaire in Appendix E.

believed to produce more accurate figures than the single questions asked in the *core*. Consequently, the non-sampling error in the *module* is believed to be lower than that in the *core*.

BPS Head Office officials intimately involved in these surveys in the last decade believe that the levels obtained from the *module* surveys are generally more accurate than those in the *core*, and therefore can serve as *benchmarks* in the years that they are available. The officials' implicit assumption is that the differential in non-sampling error between the two surveys outweighs the differential in sampling error for a particular variable. To our knowledge, no rigorous test has ever been conducted to measure the extent of these two types of error. The belief is simply based on firsthand intimate knowledge of the surveys. This report will not pass judgement on the merit of this belief. Rather, it will attempt to show the results based on it. In other words, assuming that the health and education figures in the *module* surveys are more accurate than those in the *core* surveys, the report describes the results of benchmarking *core* figures to *module* figures.

B. Computations

1. *Core*

The total expenditure on education from the *core* surveys used in this report for the 1992-2002 period were derived from Question VII.19 in Appendix A: column 2 for those in the "previous month" and column 3 for those in "the previous 12 months." Those for health were derived from Question VII.20 columns 2 and 3 respectively for the "previous month" and "previous 12 months." Data were aggregated by province. Household weights were uniform within a particular kabupaten, but different between kabupatens.[16]

The ratio of annual to monthly expenditure derived from the *core* surveys are provided in Tables 1 and 2 respectively for education and health. While annual education expenditure tend to be incurred more or less regularly during the year (as indicated by the ratios in Table 1 which are typically close to 12), annual health expenditure are typically only five times those incurred in January/February.

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16 Between 2000 and 2002, some provinces were not covered completely in the surveys. For the purpose of this report, the following adjustments were made for both education and health data and for both the "previous month" and the "previous 12 months:"
- For 2000, data for Aceh and Maluku were interpolated.
- For 2001, data for Aceh were interpolated
- For 2002, data for Aceh, Maluku and Irian Jaya were adjusted for undercoverage. Available data covered only the capital cities in these provinces. They were adjusted using the 1999 ratio of expenditure in the capital city to those in the province as a whole.

Table 1
Ratio of Annual to Monthly Education Expenditure in the Susenas *Core* Survey

Province	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Average
Aceh	11.5	12.1	11.1	9.0	10.4	10.2	10.7	10.4	11.1	11.9	12.7	11.0
Sumatera Utara	10.2	11.8	11.6	10.5	10.6	12.1	11.0	11.1	12.8	11.8	11.9	11.4
Sumatera Barat	15.0	12.0	12.5	9.9	10.2	12.5	10.8	12.0	11.2	10.9	11.5	11.7
Riau	11.5	11.9	11.3	11.0	11.0	11.3	12.1	12.0	13.2	12.2	11.0	11.7
Jambi	12.9	9.2	9.0	9.2	10.5	10.4	10.2	10.1	10.5	10.1	10.7	10.3
Sumatera Selatan	11.6	11.5	11.3	11.0	12.0	11.2	12.0	11.6	10.7	13.1	11.3	11.6
Bengkulu	12.0	12.0	10.8	11.5	11.3	12.2	10.8	12.4	10.3	12.7	10.7	11.5
Lampung	11.7	11.0	10.5	7.8	11.3	10.2	11.0	10.5	11.7	9.5	12.4	10.7
DKI. Jakarta	13.2	13.6	11.8	10.9	12.9	10.7	10.0	12.0	12.0	10.6	13.7	11.9
Jawa Barat	10.2	12.4	11.3	10.0	12.3	10.3	11.2	12.7	13.4	12.1	13.0	11.7
Jawa Tengah	10.5	11.9	11.6	11.1	11.5	11.7	11.7	11.1	13.3	11.8	11.9	11.6
DI. Yogyakarta	10.5	11.4	12.4	11.4	13.0	14.8	12.6	12.2	8.7	9.5	9.8	11.5
Jawa Timur	11.0	11.9	12.1	11.3	12.3	12.1	12.3	12.0	12.3	11.7	12.1	11.9
Bali	10.7	11.8	10.7	10.5	10.3	11.6	10.4	10.8	12.0	11.9	11.2	11.1
Nusa Tenggara Barat	9.9	12.3	10.6	9.7	10.9	10.9	11.5	11.0	11.4	9.6	11.0	10.8
Nusa Tenggara	10.6	9.9	8.8	7.6	7.8	8.5	9.1	8.4	9.4	9.9	10.0	9.1
Kalimantan Barat	12.2	11.2	12.1	10.1	12.3	11.5	11.8	12.2	12.8	11.1	11.7	11.7
Kalimantan Tengah	10.6	10.0	11.1	9.7	10.7	10.5	10.2	10.8	12.6	10.5	9.9	10.6
Kalimantan Selatan	10.8	12.3	11.5	9.2	12.8	12.8	8.0	10.8	11.4	10.8	11.8	11.1
Kalimantan Timur	11.5	11.3	12.2	11.3	12.1	11.7	12.0	11.4	12.2	11.3	10.1	11.6
Sulawesi Utara	10.2	10.6	10.2	9.9	11.7	10.3	10.4	10.4	12.0	10.5	10.3	10.6
Sulawesi Tengah	11.2	9.5	9.7	10.0	10.5	9.8	10.6	10.8	10.6	9.8	9.5	10.2
Sulawesi Selatan	12.2	9.8	10.5	9.5	10.3	10.6	10.7	10.0	11.0	8.9	11.4	10.4
Sulawesi Tenggara	13.2	9.9	8.9	9.3	9.8	9.1	8.9	11.7	9.0	8.6	9.0	9.8
Maluku	9.1	10.9	10.8	10.8	11.8	12.5	11.9	11.4	11.5	11.6	8.7	11.0
Irian Jaya	9.9	10.9	11.2	9.6	11.2	11.7	11.2	11.0	11.9	11.4	14.0	11.3
Total	11.1	12.1	11.5	10.4	11.9	11.2	11.1	11.7	12.3	11.4	12.2	11.5

Table 2
Ratio of Annual to January/February Health Expenditure in the Susenas *Core* Survey[1)]

Province	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Average
Aceh	4.1	6.8	6.9	4.8	7.0	5.9	6.8	6.5	6.0	5.5	5.1	5.9
Sumatera Utara	5.1	7.1	5.2	5.2	6.4	4.6	5.7	5.9	5.7	4.5	5.8	5.6
Sumatera Barat	5.1	6.7	6.4	5.3	6.6	6.4	6.1	6.1	5.4	6.2	6.9	6.1
Riau	5.0	6.6	6.6	6.9	6.2	6.2	7.7	7.4	6.5	5.1	6.8	6.5
Jambi	3.7	8.1	6.2	5.7	8.1	6.5	5.4	6.0	5.5	3.2	5.5	5.8
Sumatera Selatan	3.9	6.3	6.4	6.7	5.3	5.5	5.0	5.8	5.9	5.0	6.6	5.7
Bengkulu	3.5	6.6	6.1	4.5	5.1	4.2	6.0	5.8	4.4	4.9	6.8	5.3
Lampung	5.2	6.7	4.7	4.8	6.3	7.2	5.4	5.5	5.2	4.2	6.6	5.6
DKI. Jakarta	5.0	7.3	6.5	4.0	6.2	4.7	6.2	5.2	4.7	4.0	6.8	5.5
Jawa Barat	3.2	5.5	5.8	5.2	5.5	5.0	5.0	5.9	4.9	4.3	5.6	5.1
Jawa Tengah	3.7	5.5	5.7	5.2	4.8	4.3	5.9	5.4	4.9	4.9	6.1	5.1
DI. Yogyakarta	5.2	5.6	5.8	5.0	6.4	3.9	7.8	5.5	5.6	6.2	8.8	6.0
Jawa Timur	4.1	5.1	5.6	4.8	5.3	5.0	5.9	5.6	4.6	5.5	5.4	5.2
Bali	3.1	5.0	5.0	4.5	5.4	4.5	5.8	4.8	5.7	6.0	7.1	5.2
Nusa Tenggara Barat	3.5	5.4	5.2	4.7	5.6	5.2	5.5	5.0	4.2	3.4	4.7	4.8
Nusa Tenggara	4.1	5.9	5.5	4.8	5.4	5.2	5.6	5.0	4.7	4.3	4.2	5.0
Kalimantan Barat	3.5	6.0	5.4	5.3	5.4	5.5	6.1	6.4	4.9	4.6	6.5	5.4
Kalimantan Tengah	3.9	6.7	7.4	5.1	5.8	7.2	6.5	6.2	4.6	5.1	6.5	5.9
Kalimantan Selatan	4.5	5.6	6.2	4.8	5.2	5.5	5.8	5.4	3.9	5.5	6.0	5.3
Kalimantan Timur	5.1	6.9	6.4	4.8	5.8	4.9	5.4	4.4	4.6	5.7	5.8	5.4
Sulawesi Utara	3.5	5.7	5.8	5.2	5.1	3.9	6.8	6.0	5.0	4.0	5.4	5.1
Sulawesi Tengah	4.4	5.1	6.1	4.6	5.1	4.9	5.2	5.5	3.9	3.6	4.9	4.8
Sulawesi Selatan	4.7	7.3	6.2	4.2	5.6	5.5	5.9	5.4	4.0	4.1	5.5	5.3
Sulawesi Tenggara	3.8	4.9	5.7	5.7	7.2	6.9	6.6	6.3	4.3	4.3	5.6	5.6
Maluku	4.3	6.3	7.4	5.7	6.8	6.5	7.6	8.1	7.4	6.7	5.6	6.6
Irian Jaya	5.3	5.8	5.4	5.6	6.5	6.7	6.3	6.8	5.5	5.8	15.4	6.8
Total	4.0	5.8	5.8	5.0	5.6	5.0	5.8	5.6	4.9	4.7	6.0	5.3

1) Expenditure refer to those incurred in the month prior to the interview. Given that the interviews for both surveys have taken place throughout the month of February of the relevant year, expenditure in the surveys refer roughly to the average monthly expenditure in the January/February period.

2. Education *Module*

The total annual expenditure on education from the 1995, 1998 and 2000 *module* surveys were derived as follows:[17]

- for 1995, and since reporting was for the full calendar year, computation was straightforward: it was simply the sum of all

[17] Complete data for the 1992 *module*, which covered both education and health, were not available within the time frame of this report, so they were not used as benchmarks.

charges and fees reported for the year (Questions VII.I through VII.IV in the questionnaire in Appendix C).

- for 1998, since reporting was only for the July-December period, an adjustment needed to be made to obtain an annual equivalent: some charges (namely tuition, examination, study material, transportation and extra curricular activities *–iuran, evaluasi/ujian, bahan menunjang mata pelajaran, transportasi, kursus sehubungan dengan sekolah*) were considered likely to be incurred regularly and were thus doubled,[18] while the remaining charges (registration, uniforms, books, others *–pendaftaran, seragam sekolah dan olah raga, buku, lainnya*) were most likely to be one-time expenditures and were thus kept as such.

- the same adjustments were also made to the 2000 figures except that the reported items were slightly different. Items which were doubled were:[19] tuition (*SPP, BP3, Praktikum, iuran lainnya*), study material (*bahan belajar*), transportation (*transportasi*), extra-curricular activities (*kursus*). Items which were not changed were: registration, uniforms, books, stationary, other (*pendaftaran, pakaian sekolah, buku pelajar, alat tulis, lainnya*).

Data were aggregated by province. Unlike household weights in the *core* survey, which varied by kabupaten, weights in the *module* were uniform across kabupatens in the same province. That was dictated by the sample design. Table 3 shows the ratio of annual education expenditure in the *module* to that in the *core* surveys. The table suggests that when asked to report detailed education expenditure, households in Indonesia have tended to provide a level about 25% higher than the one they provide in answer to the single question on their total expenditure.

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18 Given the unusually high inflation during the year, a further adjustment was necessary for annualizing the irregular expenditure in order not to overstate their amount for the year: the original adjustment factor (namely 2) was reduced by one third to take into account the fact that average inflation in the July-December period was one third higher than that of the first half of the year. Thus the result was that the relevant expenditures were multiplied by a factor of 1.5 instead of 2.

19 Unlike 1998, no further adjustment factors were introduced to that of doubling expenditure.

Table 3
Ratio of Annual Education Expenditure in the Susenas *Module* to that of the *Core*

Province	1995	1998	2000	Average
Aceh	1.38	1.22	1.55	1.38
Sumatera Utara	1.15	1.39	1.13	1.22
Sumatera Barat	1.21	1.62	1.35	1.39
Riau	1.06	1.06	0.91	1.01
Jambi	1.21	1.58	1.45	1.41
Sumatera Selatan	0.99	1.36	1.65	1.33
Bengkulu	1.17	1.03	1.42	1.21
Lampung	1.12	1.46	1.29	1.29
DKI. Jakarta	1.19	1.34	1.15	1.23
Jawa Barat	1.30	1.32	1.27	1.30
Jawa Tengah	1.17	1.34	1.41	1.31
DI. Yogyakarta	0.80	1.01	1.06	0.96
Jawa Timur	1.06	1.31	1.24	1.20
Bali	1.19	1.35	1.44	1.33
Nusa Tenggara Barat	1.10	1.67	1.65	1.47
Nusa Tenggara Timur	0.96	1.31	1.42	1.23
Kalimantan Barat	1.11	1.11	1.21	1.14
Kalimantan Tengah	1.03	1.44	0.99	1.15
Kalimantan Selatan	1.05	1.82	1.14	1.34
Kalimantan Timur	1.10	1.12	1.15	1.12
Sulawesi Utara	1.48	1.37	1.58	1.48
Sulawesi Tengah	1.12	1.01	1.17	1.10
Sulawesi Selatan	1.22	1.38	1.46	1.35
Sulawesi Tenggara	1.00	1.88	2.12	1.67
Maluku	1.13	1.16	2.63	1.64
Irian Jaya	1.44	1.18	1.44	1.35
Total	1.17	1.32	1.27	1.25

3. Health *Module*

Expenditures on education are expected to be incurred on a regular basis during a particular calendar year, so monthly figures on education can reasonably be annualized by multiplying them by a particular factor (as Table 1 shows, one factor that can be used for the country as a whole is 11.5). Expenditures on health, on the other hand, can be highly erratic and difficult to annualize: As Table 2 shows, the average reported health expenditures for the previous year have only been five times as high as those reported for the previous one month. Furthermore, respondents' recollection of unusual expenditures (such as hospitalization) in the previous month seems likely to be much more accurate than their recollection of unusual events during the entire preceding year. Thus while comparing annual (or annualized) expenditures in the case of education was, in our view, a better method than simply comparing monthly expenditures, the same is not true of expenditures on health. We believe that in the case of health, comparing reported monthly expenditure is more meaningful.

Thus the total monthly expenditure on health (for the January/February period) from the 1995, 1998 and 2001 *module* surveys were derived as follows:

- for 1995, it was the sum of the only two available variables in that questionnaire: Questions V.3 (outpatient care –*rawat jalan*) and V.6 (inpatient care –*rawat inap*) in the questionnaire in Appendix C.[20]

- for 1998, it was computed as the sum of the following components (refer to the questionnaire in Appendix E for the exact wording of the questions):

  a. Question V.2 (personal medicines –*mengobati sendiri*)

  b. The sum of the column (2) values for Questions V.6.a through V.6.j (outpatient care –*berobat jalan*)

  c. Question V.8 (regular consultations not related to a particular illness --*konsultasi/pemeriksaan kesehatan, kir kesehatan, periksa hamil, periksa bayi*)

  d. One-twelveth of the sum of the column (3) values for Questions V.11.a through V.11.g (annual expenditure on inpatient care –*rawat inap dalam 12 bulan terakhir*).

- unlike in the previous health *module* surveys, the 2001 survey explicitly stated that the detailed questions corresponding to those asked in 1998 (namely questions V.C.21.d; column (4) of V.C.23.a through V.C.23.j; column (4) of V.C.25.a through V.C.25.g and V.C.27b) should include only those covered from the household's own sources. These numbers could not be used as benchmarks because they ignored the portion of expenditures

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20 Although the two questions clearly required reporting only on expenditures incurred from the household's own sources, our assessment was that reported responses likely referred to expenditures from all sources. When comparing response for the same households to the *core* question (which should include expenditures from all sources) and those to the *module* questions, the majority of respondents reported the same expenditure levels. The fact that the operational guidelines to the *module* left this issue vague lends support to our conclusion.

> coming from sources outside the household (which are covered in the *core*). Indeed, a comparison of these expenditures with those in the *core* survey suggests that they typically cover only about 60% of all health related expenditures. Therefore, for the purpose of benchmarking the 2001 expenditure level, we used the response to Question VII.20 (column 2), which covered health expenditures from all sources, not just from the household's own sources.[21]

Data were aggregated by province. Like household weights in the education *module*, those in the health *module* were uniform across kabupatens in the same province. Table 4 shows the ratio of monthly health expenditure in the *module* to that in the *core* survey for the January/February period. The table suggests that when asked to report detailed health expenditure, households in Indonesia have tended to provide a level about 18% higher than the one they provide in answer to the single question on their total health expenditure.

[21] Figures for Aceh and Maluku, provinces excluded from the 2001 survey, were estimated using the average share of these expenditures for each province between 1995 and 1998.

Table 4
Ratio of Monthly Expenditure on Health in the Susenas *Module* to that of the *Core* (around January/February)[1)]

Province	1995	1998	2001	Average
Aceh	1.67	1.75	2.23	1.88
Sumatera Utara	1.10	1.35	1.38	1.28
Sumatera Barat	1.53	1.43	1.10	1.35
Riau	1.16	0.97	0.75	0.96
Jambi	1.61	1.14	1.04	1.26
Sumatera Selatan	1.36	1.11	1.48	1.32
Bengkulu	1.74	0.93	0.41	1.03
Lampung	2.31	0.92	0.80	1.34
DKI. Jakarta	1.50	1.51	1.00	1.34
Jawa Barat	1.35	1.29	1.06	1.23
Jawa Tengah	0.80	1.14	0.94	0.96
DI. Yogyakarta	1.84	1.03	1.07	1.31
Jawa Timur	1.27	1.03	0.87	1.06
Bali	1.18	1.02	0.93	1.04
Nusa Tenggara Barat	1.45	1.12	0.91	1.16
Nusa Tenggara Timur	2.10	1.16	0.92	1.39
Kalimantan Barat	1.51	1.21	0.96	1.23
Kalimantan Tengah	2.63	1.74	1.34	1.90
Kalimantan Selatan	1.54	1.50	0.82	1.29
Kalimantan Timur	0.93	1.09	0.62	0.88
Sulawesi Utara	1.51	1.51	0.73	1.25
Sulawesi Tengah	2.18	1.17	0.94	1.43
Sulawesi Selatan	2.03	1.03	0.60	1.22
Sulawesi Tenggara	2.61	1.32	0.80	1.58
Maluku	1.92	1.23	1.34	1.50
Irian Jaya	2.71	1.02	1.15	1.63
Total	1.36	1.20	0.99	1.18

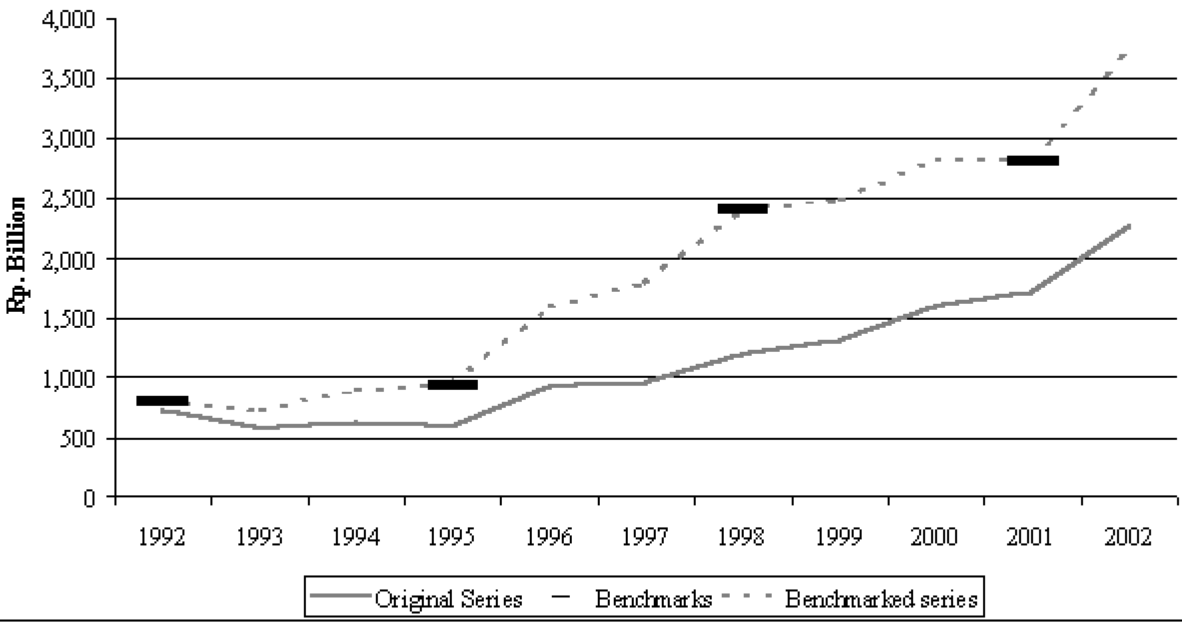
1) Expenditure refer to those incurred in the month prior to the interview. Given that the interviews for both surveys have taken place throughout the month of February of the relevant year, expenditure in the surveys refer roughly to the average monthly expenditure in the January/February period.

C. Benchmarking

Benchmarking is a technique of combining data pertaining to the same variable from two sources of different frequencies: one, which is more frequent (e.g. the *core* survey in the case of Susenas) is believed to be less accurate (because of its less detailed questions), and the other, which is less frequent (e.g. the tri-annual *module* survey of Susenas) is believed to provide a more accurate level or *benchmark.* Stated very briefly, what benchmarking does is to create a new series that uses the tri-annual levels from the more reliable survey while preserving, as far as possible, the fluctuations from year to year in the annual series. A well-known benchmarking technique is the proportional Denton method which preserves to a maximum degree the fluctuations in the more frequent source data by minimizing the differences (in a least squares sense) between year-to-year percent change of the original and benchmarked series. This method is automated as a particular case of a program called BENCH developed and used by Statistics Canada.[22]

Figure 1 provides an illustration of what the benchmarking technique does. Annual levels from the *core* survey (referred to as "original series") are derived for 1992-2002. Tri-annual levels from the *module* are referred to as "benchmarks". Finally, the new adjusted series (referred to as the "benchmarked series"), which uses the levels from the *module* for the years they are available, and year-to-year changes in-between in a pattern very close to that of the original series.

Figure 1: Illustration of Benchmarking Annual & Tri-Annual Series



The benchmarked series in the graph clearly incorporates the levels of the four benchmarks. At the same time, it retains as much as possible the year-to-year fluctuations of the original series. Mathematically, it minimizes the squared differences between yearly percent changes in the original series and yearly percent changes in the benchmarked series, subject to the constraints of being equal to the levels of the four benchmarks.

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22 A manual produced by John Kuiper describes the basic methodology and operation of the program (*Operational Manual for Benchmarking Using the BENCH Program*, STAT Project Report #57, July, 2002).

III. RESULTS

Since BPS has not yet published the data used in this report, we will present the results of the benchmarking exercise in graphic form. Figures 2 through 7 present results for benchmarking education expenditure for Indonesia and for some main provinces, and Figures 8 through 13 present those on health. Focusing on results for the country as a whole, nominal expenditure on education appear to have grown almost stepwise since 1993 (with spurts in 1995, 1998, 2000 and 2002), whereas nominal expenditure on health have witnessed a more or less continuous rise before falling in 2002.[23]

[23] The levels of annual expenditures on education used in the graphs represent about 4% of total household consumption expenditure (derived from the Susenas Income and Expenditure *module* surveys), and those of annualized health expenditure (i.e. monthly expenditure used in the graphs multiplied by 5) represent about 2% of total household consumption expenditure.

Figure 2: Household Annual Expenditure on Education (Indonesia)

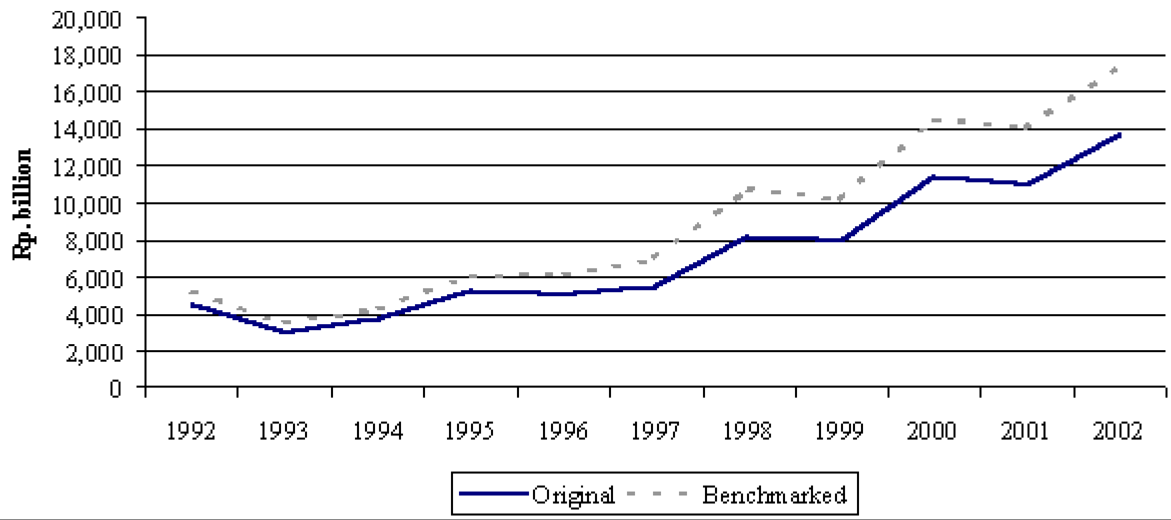


Figure 3: Household Annual Expenditure on Education (DKI)

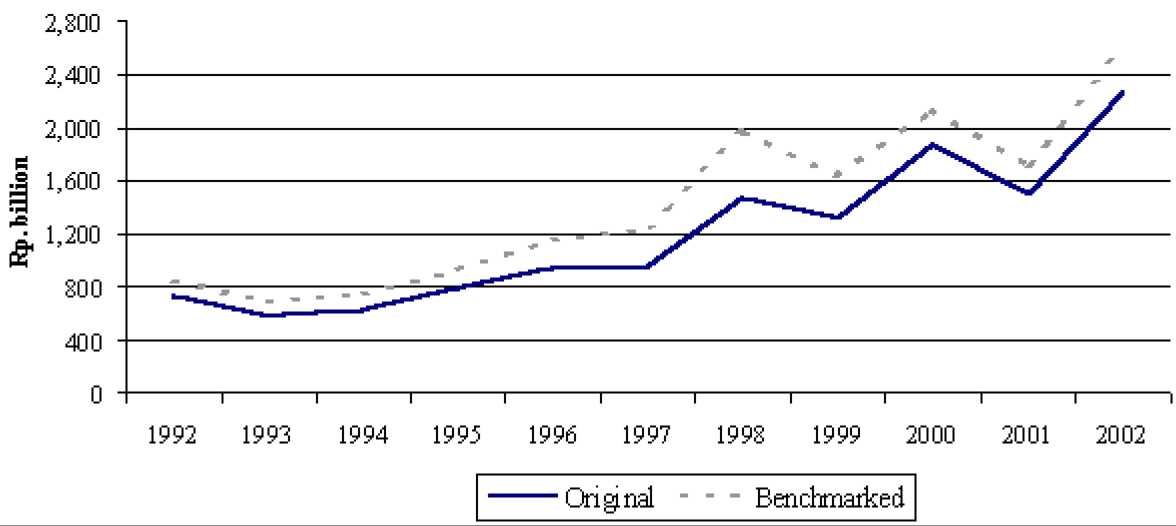


Figure 4: Household Annual Expenditure on Education (Jawa Barat)

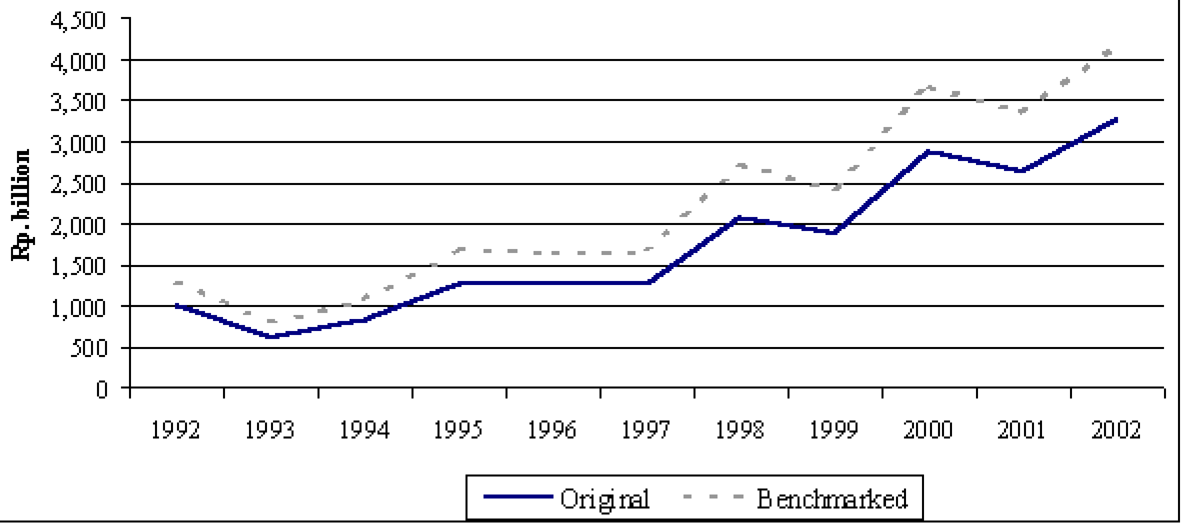


Figure 5: Household Annual Expenditure on Education (Jawa Tengah)

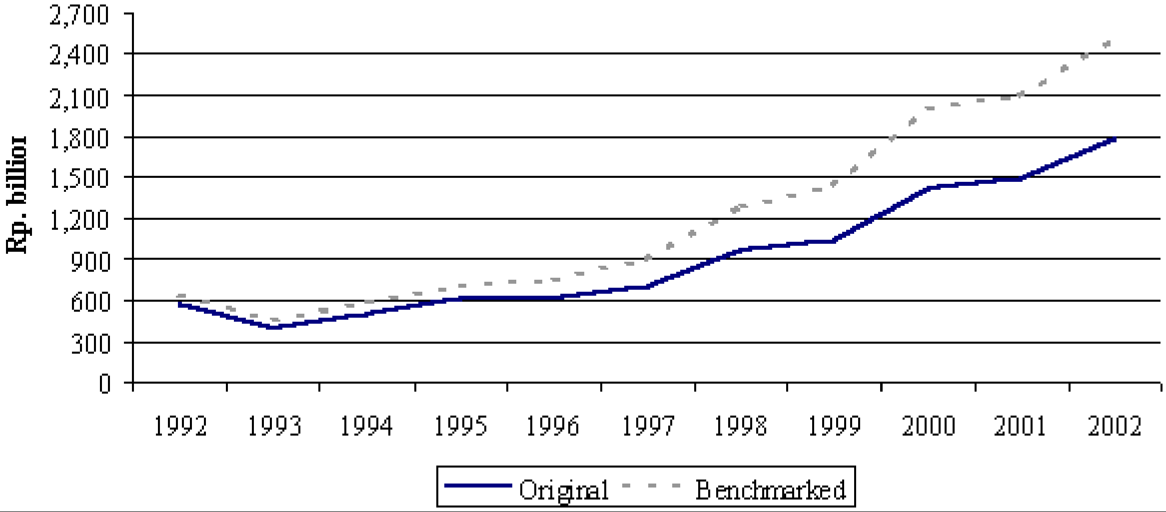


Figure 6: Household Annual Expenditure on Education (Jawa Timur)

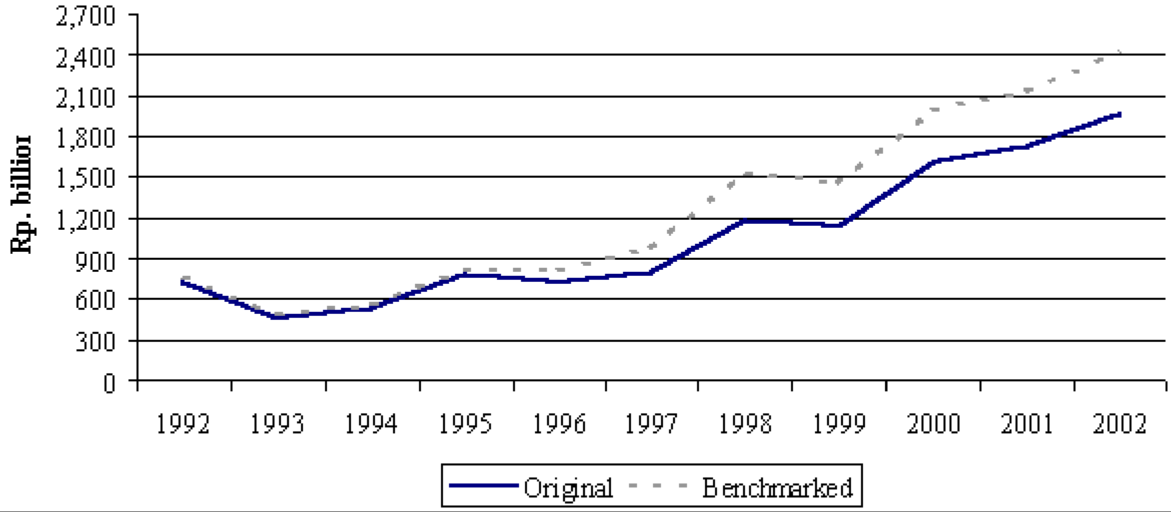


Figure 7: Household Annual Expenditure on Education (Sumatera Utara)

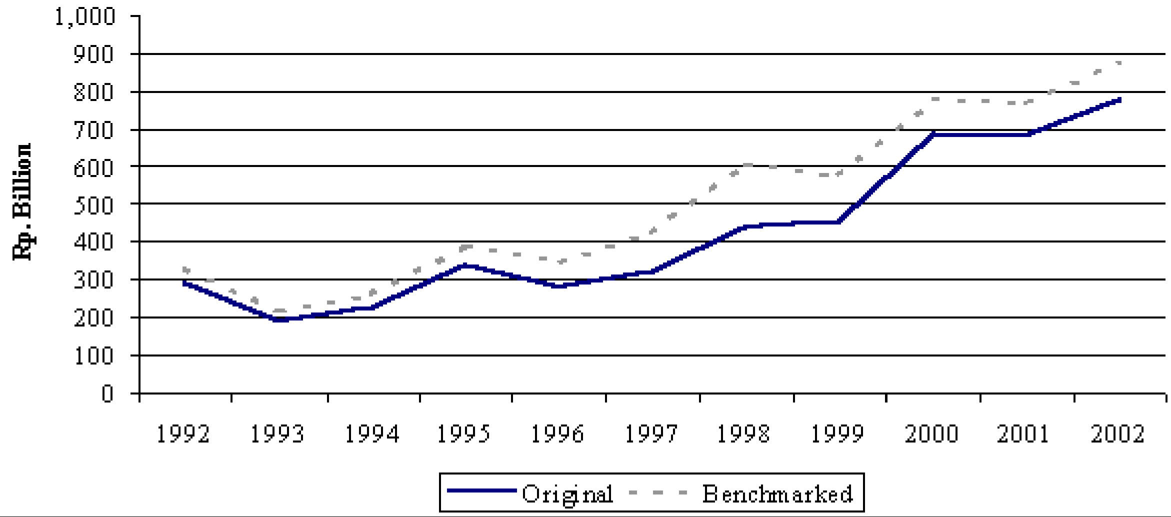


Figure 8: Household Expenditure on Health in January/February (Indonesia)

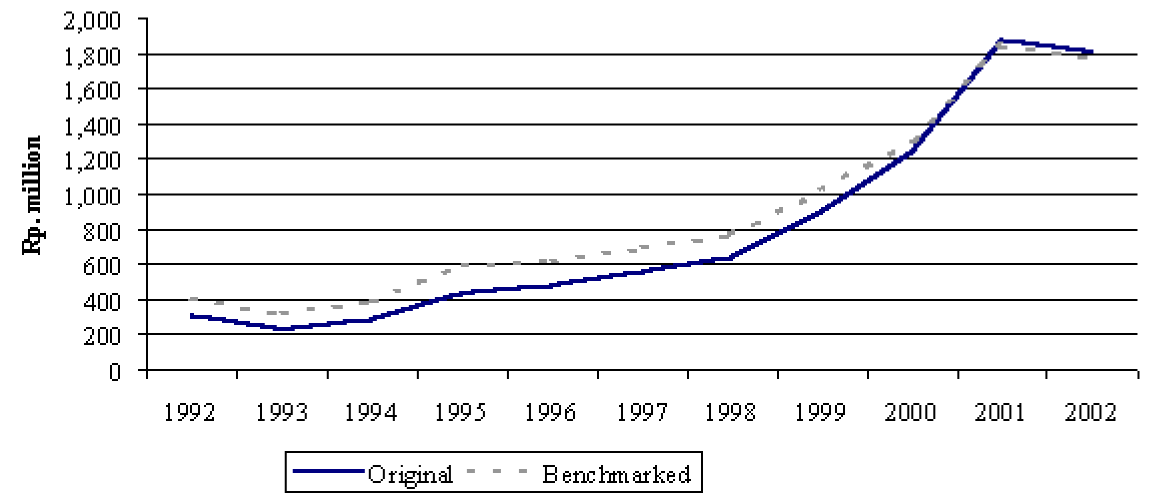
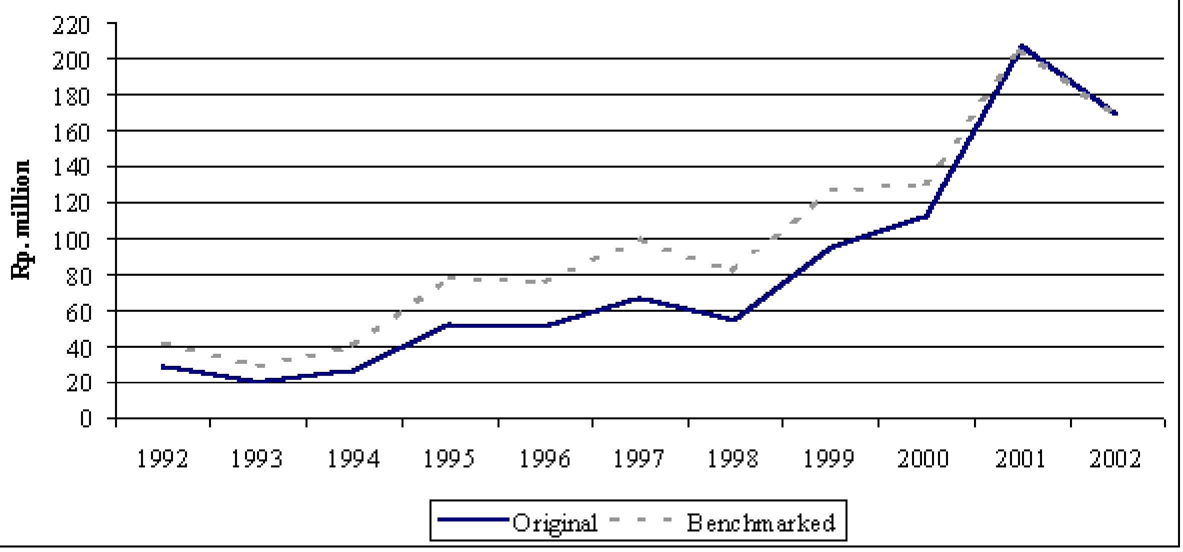


Figure 9: Household Expenditure on Health in January/February (DKI)



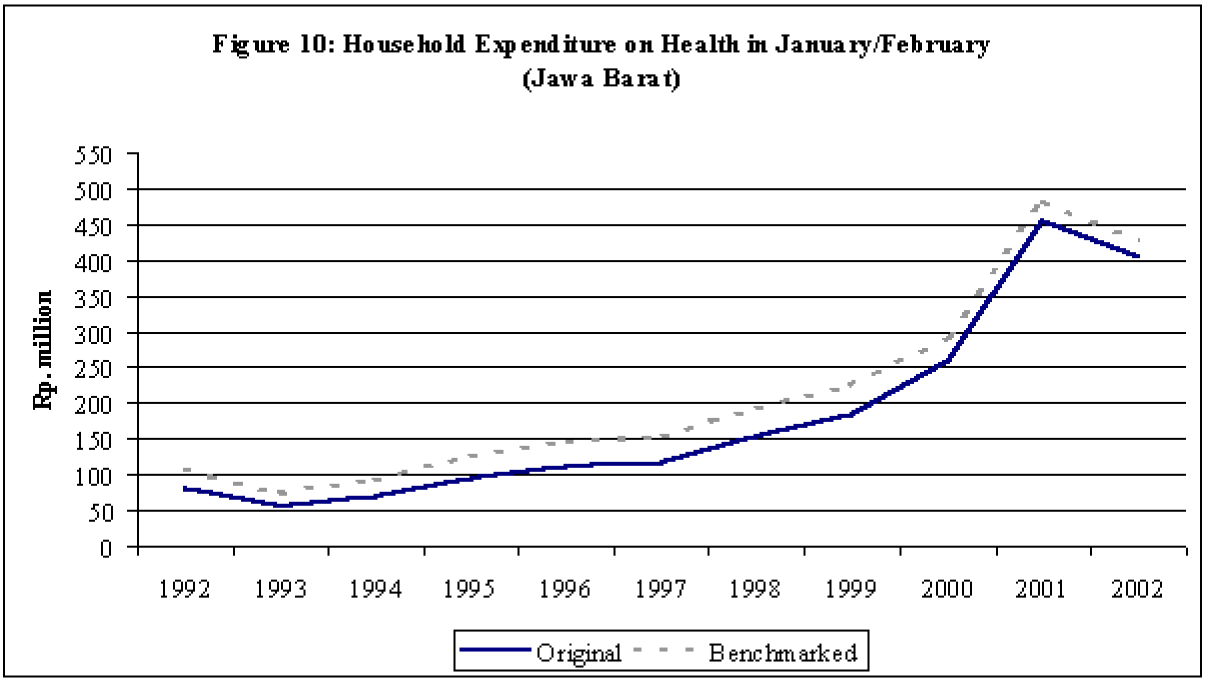


Figure 10: Household Expenditure on Health in January/February
(Jawa Barat)
Rp. million
550
500
450
400
350
300
250
200
150
100
50
0
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002
Original
Benchmarked

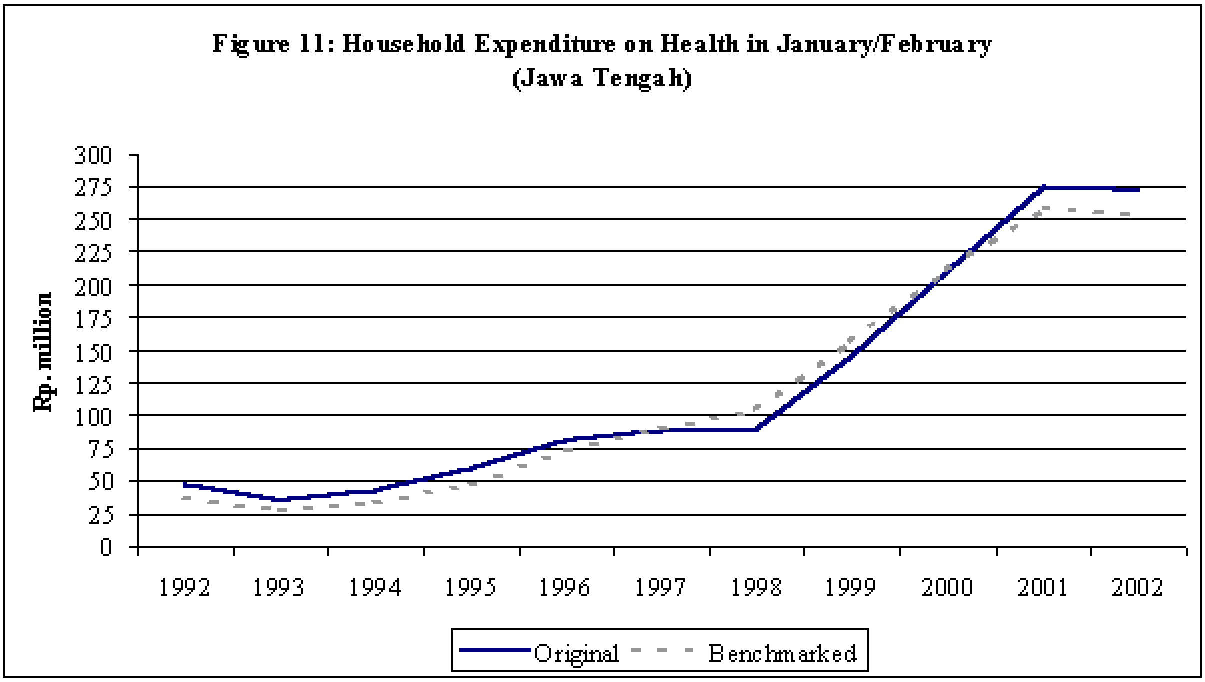


Figure 11: Household Expenditure on Health in January/February
(Jawa Tengah)
Rp. million
300
275
250
225
200
175
150
125
100
75
50
25
0
1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002
Original
Benchmarked

Figure 12: Household Expenditure on Health in January/February (Jawa Timur)

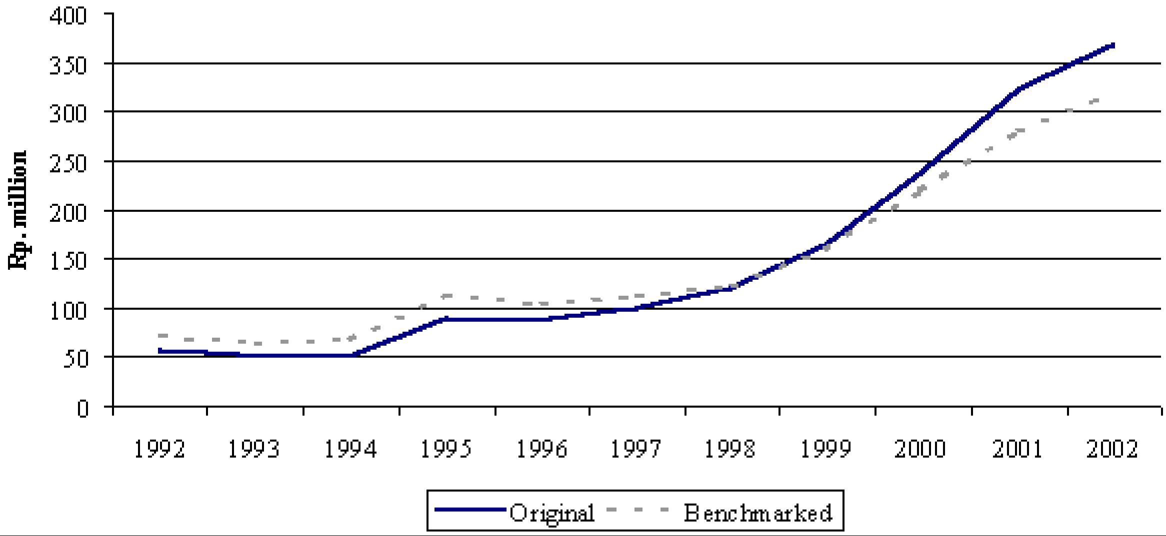
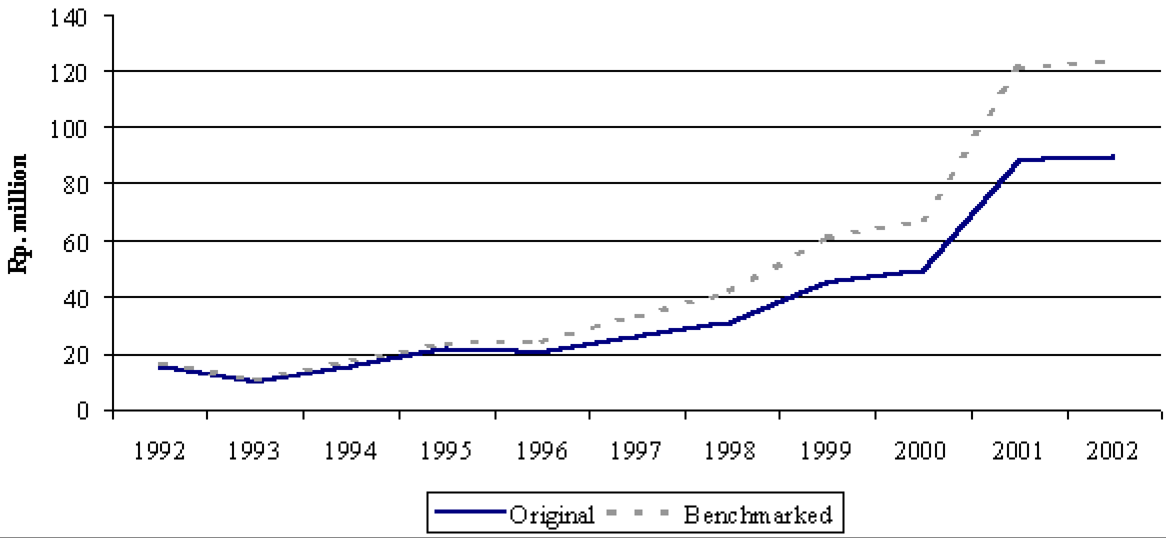


Figure 13: Household Expenditure on Health in January/February (Sumatera Utara)



IV. CONCLUSION & RECOMMENDATIONS

The above results suggest the following conclusion: data on education and health expenditure levels in Susenas, both at the provincial and national levels, appear plausible and may provide valuable insight to users interested in more than just shares of these expenditures by income group, as is currently published by BPS. The benchmarking methodology undertaken in this report, which allowed combining the strengths of the two data sources (namely the *core* and *module* surveys) into a single data series, carried one further substantial benefit: by highlighting data gaps in particular series, which needed to be corrected, it helped BPS identify potential sources of data problems to avoid in future surveys, thus increasing confidence in these data.

We believe that users, whether policy makers or researchers, interested in rupiah expenditure levels would welcome a regular BPS publication showing how these expenditures are progressing from year to year under changing economic conditions. Our strong recommendation, therefore, is for BPS to:

- Make available to users, in a separate publication similar to that done for Industry in 2001, an annual benchmarked series of household levels of expenditure on education and health for their evaluation.

- If user feedback is positive, then BPS should be ready to replicate the benchmarking of these variables regularly and provide them in the annual Susenas publication.

- Meantime, it would be useful if BPS began examining other types of expenditures in Susenas to evaluate the possibility of applying the methodology used in this report. Results can then also be shared with users for their feedback.

- Finally, it may also be useful for BPS to take steps which would help in assessing quantitatively whether data from the *module* surveys provide more accurate levels than those from the *core* surveys, particularly if such data will be regularly published. That may help increase confidence that benchmarking as attempted in this report, namely by using the *module* levels as benchmarks, has an empirical, rather than a judgmental, basis.

APPENDIX A
A TYPICAL QUESTIONNAIRE FOR THE *CORE* SURVEY

This appendix provides only relevant parts of the questionnaire of the 2002 Susenas *Core* survey: the household characteristics section and that covering household expenditures on education and health. These questions have generally been the same in other years.

SUSENAS **VSEN2002.K**

REPUBLIK INDONESIA
BADAN PUSAT STATISTIK

SURVEI SOSIAL EKONOMI NASIONAL 2002

KETERANGAN POKOK RUMAH TANGGA DAN ANGGOTA RUMAH TANGGA

Rahasia

I. PENGENALAN TEMPAT			
1	Propinsi		
2	Kabupaten/kota*)		
3	Kecamatan		
4	Desa/kelurahan*)		
5	Klasifikasi desa/kelurahan	*1. Perkotaan 2. Perdesaan*	
6	Nomor blok sensus		
7	Nomor kode sampel		
8	Nomor urut sampel rumah tangga		

II. KETERANGAN RUMAH TANGGA					
1	Nama kepala rumah tangga (krt):		4	Banyaknya anak usia 0-4 tahun:	
2	Suku bangsa krt:		5	Banyaknya art yang meninggal dalam setahun yang lalu:	
3	Banyaknya anggota rumah tangga (art):		6	Banyaknya art yang lahir dalam setahun yang lalu:	

III. KETERANGAN PENCACAHAN					
1	Nama dan NIP pencacah:		5	Nama dan NIP pengawas/ pemeriksa:	
2	Jabatan pencacah: *1. Staf BPS Propinsi 2. Staf BPS Kab/Kota 3. Mantis 4. Mitra*		6	Jabatan pengawas/pemeriksa: *1. Staf BPS Propinsi 2. Staf BPS Kab/Kota 3. Mantis 4. Mitra*	
3	Tanggal pencacahan:	Tanggal / Bulan	7	Tanggal pengawasan/ pemeriksaan:	Tanggal / Bulan
4	Tanda tangan pencacah:		8	Tanda tangan pengawas/pemeriksa:	

*) Coret yang tidak perlu

VII. PENGELUARAN RUMAH TANGGA (LANJUTAN)

VII.B. PENGELUARAN BUKAN MAKANAN (BERASAL DARI PEMBELIAN, PRODUKSI SENDIRI DAN PEMBERIAN)	Sebulan yang Lalu (Rp)	12 bulan yang Lalu (Rp)
(1)	(2)	(3)
17. **Perumahan dan fasilitas rumah tangga** a. Sewa, perkiraan sewa rumah sendiri, bebas sewa, dinas, kontrak, dll		
b. Rekening listrik, rekening telepon, gas, minyak tanah, air, kayu bakar, dll		
c. Pemeliharaan rumah dan perbaikan ringan		
18. **Aneka barang dan jasa** (sabun mandi, kecantikan, pengangkutan, bacaan, pembuatan KTP/SIM, rekreasi, kartu telepon, benda pos, dan lainnya)		
19. **Biaya pendidikan** (uang pendaftaran, SPP, POMG/BP3, uang pangkal/daftar ulang, pramuka, prakarya, kursus, dan lainnya)		
20. **Biaya kesehatan** (rumah sakit, puskesmas, dokter praktek, dukun, obat-obatan, dan lainnya)		
21. **Pakaian, alas kaki, dan tutup kepala** (bahan pakaian, pakaian jadi, sepatu, topi, sabun cuci, dan lainnya)		
22. **Barang tahan lama** (alat rumah tangga, perkakas, alat dapur, alat hiburan (elektronik), alat olahraga, perhiasan mahal/imitasi, kendaraan, payung, arloji, kamera, pasang telepon, pasang listrik, barang elektronik, dll)		
23. **Pajak dan asuransi** a. Pajak (PBB, iuran TV, pajak kendaraan)		
b. Asuransi (asuransi kecelakaan, asuransi kesehatan)		
24. **Keperluan pesta dan upacara** (perkawinan, khitanan, ulang tahun, perayaan hari agama, upacara adat, dan lainnya)		
25. **Jumlah bukan makanan** (Rincian 17 s.d. Rincian 24)		
26. **Rata-rata pengeluaran makanan sebulan** (Rincian 16 x $\frac{30}{7}$)		
27. **Rata-rata pengeluaran bukan makanan sebulan** $\frac{\text{(Rincian 25 Kolom 3)}}{12}$		
28. **Rata-rata pengeluaran rumah tangga sebulan** (Rincian 26 + Rincian 27)		
29. **Sumber penghasilan utama rumah tangga:** .... **(Tulis selengkap-lengkapnya)** Isikan kode lapangan usaha/penerima pendapatan dan status pekerjaan sesuai sumber penghasilan utama rumah tangga dalam kotak. Tiga digit pertama untuk kode lapangan usaha/penerima pendapatan dan satu digit terakhir untuk kode status pekerjaan Kode status pekerjaan: 1. Buruh/karyawan 2. Pengusaha		diisi Editor

APPENDIX B
QUESTIONNAIRE FOR THE 1992 *MODULE* SURVEY

This appendix provides only relevant parts of the questionnaire of the 1992 Susenas *Module* survey: the household characteristics section and those covering household expenditures on education and health.

APPENDIX C
QUESTIONNAIRE FOR THE 1995 *MODULE* SURVEY

This appendix provides only relevant parts of the questionnaire of the 1995 Susenas *Module* survey: the household characteristics section and those covering household expenditures on education and health.

SUSENAS VSEN95.M

REPUBLIK INDONESIA
BIRO PUSAT STATISTIK

SURVEI SOSIAL EKONOMI NASIONAL 1995

KETERANGAN KESEHATAN, PENDIDIKAN, DAN PERUMAHAN & PERMUKIMAN

Rahasia

I. PENGENALAN TEMPAT

01	Propinsi		
02	Kabupaten/kotamadya *)		
03	Kecamatan		
04	Desa/kelurahan *)		
05	D a e r a h	Perkotaan 1 Perdesaan 2	
06	Nomor wilayah pencacahan		
07	Nomor kelompok segmen		
08	Nomor segmen		
09	Nomor kode sampel Susenas		
10	Nomor urut rumahtangga sampel		
11	Klasifikasi desa diisi Editor	Kode Pengolahan diisi BPS	

II. KETERANGAN RUMAHTANGGA

01	Nama kepala rumahtangga:	03	Banyaknya anak usia 0-4 tahun:
02	Jumlah anggota rumahtangga:	04	Banyaknya art berumur 5-39 tahun yang bersekolah:

III. KETERANGAN PENCACAHAN

01	Nama dan NIP/NMS pencacah:	05	Nama dan NIP/ NMS pengawas/ pemeriksa:
02	Jabatan pencacah: Staf KS Propinsi 1 Mantis 3 Staf KS Kab/Kodya 2 Mitra 4	06	Jabatan pengawas/pemeriksa: Staf KS Propinsi 1 Mantis 3 Staf KS Kab/Kodya 2 Mitra 4
03	Tanggal pencacahan:	07	Tanggal pengawasan/ pemeriksaan:
04	Tanda tangan pencacah:	08	Tanda tangan pengawas/ pemeriksa:

*) Coret yang tidak perlu

3

V. KETERANGAN KESEHATAN ANGGOTA RUMAHTANGGA

Nama: .... No.urut: ......

1. Pernah berobat/rawat jalan dalam 1 bulan terakhir? (Cek pada Kor Blok V R.7 Kol.2)
   Ya 1 Tidak 2 (ke R.4)

2. Sumber biaya pengobatan/rawat jalan?
   Ya 1 Tidak 2

a. Rumahtangga		d. Perusahaan/kantor	
b. Askes		e. Jasa Raharja	
c. Astek		f. Pihak lain	

3. Bila R.2a berkode 1, biaya yang dikeluarkan rumahtangga (Rp.)

4. Pernah rawat inap dalam 1 bulan terakhir? (Cek pada Kor Blok V R.7 Kol.3)
   Ya 1 Tidak 2 (ke R.7)

5. Sumber biaya pengobatan/rawat inap?
   Ya 1 Tidak 2

a. Rumahtangga		d. Perusahaan/kantor	
b. Askes		e. Jasa Raharja	
c. Astek		f. Pihak lain	

6. Bila R.5a berkode 1, biaya rawat inap yang dikeluarkan rumahtangga (Rp.)

7. Apakah mengalami gangguan/kesulitan/kecacatan?

(i) Tidak ada 1 Sedang 3 Sangat berat 5
Ringan 2 Berat 4

a. Penglihatan		d. Rasa raba	
b. Pendengaran		e. Kejang/ayan	
c. Bicara		f. Belajar/terbelakang	

(ii) Tidak ada gangguan 1 Ada gangguan 2

g. Perilaku/jiwa		i. Sendi	
h. Pikun		j. Kelumpuhan	

(iii) Lengkap 1 Tidak lengkap 2

k. Anggota atas		l. Anggota bawah	

(Bila tidak ada gangguan/kesulitan/kecacatan, langsung ke R.10)

8. Apakah penyebab gangguan/kecacatan tsb.?
   Kecelakaan:
   Dalam rumah 1
   Lalu lintas 2
   Pabrik 3
   Konstruksi 4
   Tempat lain 5
   Penyakit 6
   Sejak lahir 7
   Kriminalitas 8
   Bencana alam 9
   Lainnya 0

9. Apakah memakai alat bantu?
   Ya 1 Tidak 2

10. Apakah minum/memakai jamu/obat tradisional dalam 1 bulan terakhir?
    Ya 1 Tidak 2 (ke R.13)

11. Kalau Ya, buatan siapa? (Jumlahkan kode bila lebih dari satu)
    Sendiri 1
    Pabrik 2
    Orang lain 4
    Penjaja jamu gendong/obat tradisional 8

12. Untuk apa jamu/obat tradisional tersebut diminum/dipakai? (Jumlahkan kode bila lebih dari satu)
    Pengobatan 1
    Peluntur 2
    Seks 4
    Pemeliharaan kesehatan 8
    Lainnya 16

HANYA UNTUK UMUR 0-4 TAHUN

13. Berat badan balita: .... kg

HANYA UNTUK UMUR 1 TAHUN KE ATAS

14. Apakah mempunyai kebiasaan menggosok gigi setiap hari?
    Ya, sesudah makan 1
    Ya, sebelum tidur malam 2
    Ya, sesudah bangun tidur 4
    Ya, lainnya 8
    Tidak 00

15. Apakah memeriksakan gigi ke dokter gigi/perawat gigi dalam 6 bulan terakhir?
    Ya 1 Tidak 2 (ke R.17)

16. Untuk apa tujuan ke dokter gigi/perawat gigi tersebut?
    Berobat karena sakit gigi 1
    Pasang gigi palsu 2
    Pemeriksaan/check up saja 4
    Lainnya 8

HANYA UNTUK UMUR 5 TAHUN KE ATAS

17. Apakah mengalami kesulitan/memerlukan bantuan orang lain dalam melakukan kegiatan sehari-hari berikut?
    Tidak ada 1
    Agak sulit tetapi belum memerlukan bantuan 2
    Dengan bantuan 3
    Dengan bantuan sepenuhnya 4

a. Bangun/berbaring		e. Mandi	
b. Duduk/berdiri		f. Berpakaian	
c. Berjalan		g. Makan	
d. Buang air		h. Bermain/sekolah/kegiatan sosial	

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HANYA UNTUK UMUR 10 TAHUN KE ATAS

18. Apakah mengalami kesulitan dalam melakukan kegiatan sehari-hari berikut ini?

Mudah 1 Sukar 2 Tidak bisa 3

a. Mengambil makanan untuk sendiri
b. Pekerjaan rumahtangga ringan
c. Membeli barang/ belanja
d. Bepergian sendiri
e. Pekerjaan rumahtangga berat

19. Sudah berapa lama gangguan/kesulitan di R.17 atau R.18 berlangsung?

.... bulan

20. Apakah merokok dalam 1 bulan terakhir?

Ya, tiap hari 1
Ya, kadang-kadang 2 → [ke R.23]
Tidak merokok 3

21. Apakah sebelumnya merokok?

Ya, tiap hari 1
Ya, kadang-kadang 2
Tidak merokok 3 → [ke R.27]

22. Sudah berapa lama berhenti merokok?

.... bulan

23. Berapa batang rokok yang biasa dihisap tiap hari?

.... batang

24. Jenis rokok yang biasa dihisap?

Putih filter	1	Cerutu	5
Putih nonfilter	2	Linting	6
Kretek filter	3	Siong	7
Kretek nonfilter	4	Cangklong	8

25. Apakah merokok ketika sedang berada di dalam rumah sendiri?

Ya 1 Tidak 2

26. Pada usia berapa mulai merokok?

.... tahun

27. Apakah melakukan olah raga dalam 3 bulan terakhir?

Ya 1 Tidak 2 (ke R.31)

28. Berapa kali rata-rata dilakukan:

1-2 kali dalam 3 bulan	1	1-2 kali/minggu	3
		3-5 kali/minggu	4
1-2 kali/bulan	2	Tiap hari (6-7 kali/minggu)	5

29. Berapa lama rata-rata:

< 10 menit	1	20-29 menit	3
10-19 menit	2	≥ 30 menit	4

30. Klasifikasi jenis olahraga:

Ringan (jalan kaki, bilyar) 1
Sedang (voli, pingpong, SKJ) 2
Agak berat (sepeda gunung, lari santai) 3
Berat (tennis, badminton, sepak bola) 4
Sangat berat (dayung, basket, angkat besi) 5

31. Pekerjaan/aktivitas fisik responden sehari-hari tergolong:

Ringan 1 Sedang 2 Berat 3

UNTUK SELURUH ART YANG BERUMUR 15 TAHUN KE ATAS

32. Apakah pernah mengemudi/dibonceng sepeda motor di jalan umum dalam 12 bulan terakhir?

Ya 1 Tidak 2 [ke R.34]

33. Bila R.32 = 1, apakah memakai helm?

Selalu	1	Kadang-kadang	3
Sering	2	Tidak pernah	4

34. Jumlah saudara wanita yang seibu yang pernah kawin (termasuk yang sudah meninggal):

35. Jumlah saudara wanita yang seibu yang pernah kawin yang masih hidup:

36. Jumlah saudara wanita yang seibu yang pernah kawin yang sudah meninggal:

37. Bila R.36 ada isian, berapa orang yang meninggal waktu hamil, melahirkan atau dalam 40 hari sesudah akhir kehamilan:

38. Nama yang meninggal di R.37 ....

39. Bulan dan tahun meninggal

40. Tempat meninggal:

RS Swasta 1
RS Pemerintah 2
Klinik/Puskesmas 3
Rumah 4
Di jalan 5
Lainnya 6
Tidak tahu 7

HANYA UNTUK UMUR 30 TAHUN KE ATAS

41. Apakah dalam 5 tahun terakhir pernah melakukan pemeriksaan kesehatan umum/ general check-up (paling sedikit pemeriksaan fisik, darah, dan rontgen)?

Ya 1 Tidak 2

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VI. PENDIDIKAN DAN AKTIVITAS ANGGOTA RUMAHTANGGA BERUMUR 5-39 TAHUN

Nama: .... No: ....

1. Lama bersekolah (dalam tahun bilangan bulat)
   (Isikan kode 88 bila belum/tidak pernah bersekolah, dan lanjutkan ke R.5a)

2. Bila pernah bersekolah (R.1 ≠ 88)
   a. Tahun mulai masuk SD/MI: a
   b. Tahun berhenti sekolah: b
   (Isikan 00 bila masih bersekolah, dan lanjutkan ke R.4)

3. Bila tidak bersekolah lagi, apakah sudah tamat jenjang pendidikan yang terakhir diduduki?
   Sudah 1 → (ke R.5b) ← Belum 2

4. Bila masih bersekolah, apakah ingin melanjutkan ke jenjang yg lebih tinggi?
   Ya 1 (ke R.6) Tidak 2 (ke R.5c)

5. a. Mengapa belum/tidak pernah bersekolah?
   b. Mengapa dulu berhenti bersekolah?
   c. Mengapa tidak ingin melanjutkan bersekolah?

Karena umur	1
Tidak diterima/pikiran tidak mampu/ nilai kurang untuk melanjutkan	2
Bekerja sebagai pekerja keluarga	3
Bekerja bukan sbg pekerja keluarga	4
Kesulitan biaya	5
Merasa pendidikan cukup	6
Tidak suka/tidak ada motivasi/malu	7
Sekolah jauh	8
Menikah/berkeluarga	9
Sakit/cacat	10
Sedang cuti/mendaftar ke jenjang yang lebih tinggi	11
Membantu mengurus rumahtangga	12

6. Partisipasi kursus: Ya 1 Tidak 0

	Pernah	Sedang	Akan	Diisi Editor
a) Kerumahtanggaan				a
b) Kesehatan				b
c) Keolahragaan				c
d) Pertanian & Peternakan				d
e) Kesenian				e
f) Industri/Kerajinan				f
g) Teknik				g
h) Jasa				h
i) Bahasa				i
j) Khusus				j
k) Lainnya (sebutkan):				k

7. Bila sedang mengikuti kursus jasa/khusus, jenis kursus yang sedang diikuti:
   Ya 1 Tidak 0
   a) Steno/mengetik a
   b) Tata buku/akuntansi b
   c) Komputer c
   d) Pertukangan d
   e) Kursus jasa lainnya e
   f) Bimbingan belajar f
   g) Kursus khusus lainnya g

8. Rata-rata biaya per bulan untuk semua jenis kursus yang sedang diikuti: (000 Rp)
   Rp ....

KHUSUS ANAK USIA 5-9 TAHUN

9. Kegiatan yang terbanyak dilakukan selama seminggu yang lalu:
   Bekerja 1 [R.12] Mengurus rumahtangga 3
   Sekolah 2 Lainnya 4

10. Jika R.9 bukan berkode 1, apakah bekerja paling sedikit 1 jam selama seminggu yang lalu?
    Ya 1 (ke R.12) Tidak 2

11. Jika R.10= 2, punya pekerjaan/usaha tetapi, sementara tidak bekerja selama seminggu yang lalu?
    Ya 1 Tidak 2 (ke Blok VII)

12. a. Jumlah hari kerja: .... hari a
    b. Jumlah jam kerja seluruh pekerjaan, setiap hari selama seminggu yl. b
    Hari ke:

1	2	3	4	5	6	7	Jumlah
...	...	...	...	...	...	...	..... jam

13. Jenis pekerjaan utama selama seminggu yang lalu (tulis selengkap mungkin): diisi BPS
    ....

14. Lapangan usaha (pekerjaan) utama seminggu yang lalu:
    Pertanian 1 Konstruksi 4
    Pertambangan/penggalian 2 Perdagangan 5
    Industri 3 Jasa 6
    Lainnya 7

15. Status pekerjaan utama seminggu yang lalu:
    Berusaha sendiri 1 Pekerja keluarga 2
    Buruh 3

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VII. BIAYA PENDIDIKAN ANGGOTA RUMAHTANGGA BERUMUR 5-39 TAHUN YANG MASIH BERSEKOLAH

Nama: .... No: ......

1. Terdaftar dan aktif di sekolah:

S D	01	M. Aliyah	07
M. Ibtidaiyah	02	D2/PGSD	08
SMP Umum	03	Akademi/D3	09
M. Tsanawiyah	04	S1/D4	10
SMA Umum	05	S2/S3	11
SMA Kejuruan	06	U7	12

2. Jurusan pendidikan (Bila R.1= 12 ke R.6):
(............................)

3. Jarak terdekat yang biasa ditempuh dari tempat tinggal ke sekolah:
.... km

4. Lama perjalanan dari tempat tinggal ke sekolah:
.... menit

5. Sarana pergi ke sekolah:
- Kendaraan bermotor yg dikuasai rt 1
- Kendaraan tidak bermotor yang dikuasai rt 2
- Kendaraan umum bermotor 3
- Kendaraan umum tdk bermotor 4
- Kendaraan orang lain gratis 5
- Jalan kaki 6

6. Yang menanggung biaya tinggal/makan terbanyak:

Orang tua	1	Orang lain	4
Saudara se ayah/ se ibu	2	Sendiri	5
		Pemerintah	6
Famili	3	Yayasan/lembaga	7

7. Yang menanggung biaya bersekolah terbanyak:

Orang tua	1	Orang lain	4
Saudara se ayah/ se ibu	2	Sendiri	5
		Pemerintah	6
Famili	3	Yayasan/lembaga	7

8. a. Belajar di luar jam sekolah?
Ya 1 Tidak 2 (ke R.10)

b. Belajar berkelompok?
Ya 1 Tidak 2

c. Belajar dengan bantuan pembimbing?
Ya 1 Tidak 2 (ke R.9)

d. Membayar pembimbing?
Ya 1 Tidak 2

e. Yang membimbing:
Art 1 Teman sekolah 3
Famili 2 Orang lain 4

9.a. Tempat belajar di luar jam bersekolah:
Di dalam rumah 1 Di luar rumah 2

b. Rata-rata lama belajar di luar jam bersekolah per hari dalam seminggu:
.... jam

diisi BPS

10. Ketersediaan buku wajib:
(hanya untuk SD, SMP, SMA, dan sederajat)
Lengkap 1 Tdk lengkap 2 Tdk ada 3

a. PMP	d. IPA	g. Fisika
b. Bahasa Indonesia	e. IPS	h. Kimia
c. Matematika	f. Bahasa Inggris	i. Biologi

Jenis Pengeluaran	Biaya yang dikeluarkan: Bulan terakhir (Rp)	Biaya yang dikeluarkan: Selama satu tahun ajaran (000 Rp)
(1)	(2)	(3)
I. Biaya bersekolah (R11+R12+R13)		
11. Pendaftaran (uang pangkal/ gedung, daftar ulang)		
12. Iuran-iuran (a+b+c+d)		
a. SPP		
b. POMG/BP3		
c. Praktikum/Ketrampilan		
d. Iuran lainnya (al. OSIS)		
13. Evaluasi/Ujian		
II. Biaya peralatan & perlengkapan bersekolah (R14+R15+R16)		
14. Bahan penunjang mata pelajaran		
15. Seragam sekolah & olahraga		
16. Buku, alat tulis dan perlengkapan bersekolah (a+b)		
a. Buku pelajaran/panduan/ diktat		
b. Alat tulis dan perlengkapan lainnya		
III. Transportasi dan kursus (R17+R18)		
17. Transportasi (termasuk biaya antar jemput)		
18. Kursus sehubungan dengan sekolah/kuliah		
IV. Lainnya		
T O T A L : (I+II+III+IV)		

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APPENDIX D
EDUCATION QUESTIONNAIRE FOR THE 1998 *MODULE* SURVEY

This appendix provides only relevant parts of the education questionnaire of the 1998 Susenas *Module* survey: the household characteristics section and that covering household expenditures on education. Although this survey covered health as well as education, the health questionnaire was separated from that of other topics because it contained far more detailed questions than in the past.

SUSENAS **VSEN98.MPP**

REPUBLIK INDONESIA
BIRO PUSAT STATISTIK

SURVEI SOSIAL EKONOMI NASIONAL 1998

KETERANGAN PENDIDIKAN, PERUMAHAN
DAN PERMUKIMAN

Rahasia

I. PENGENALAN TEMPAT			
01	Propinsi		
02	Kabupaten/kotamadya*)		
03	Kecamatan		
04	Desa/kelurahan*)		
05	Daerah	*Perkotaan 1 Pedesaan 2*	
06	Nomor wilayah pencacahan		
07	Nomor kelompok segmen		
08	Nomor segmen		
09	Nomor kode sampel		
10	Nomor urut rumah tangga sampel		
11	Klasifikasi desa	*Tertinggal 1* *Tidak tertinggal 2*	**diisi Editor**

II. KETERANGAN RUMAH TANGGA			
01	Nama kepala rumah tangga:	03	Banyaknya art berumur 3-7 tahun yang berpartisipasi di TK/BA/RA
02	Banyaknya anggota rumah tangga:	04	Banyaknya art berumur 5-39 tahun yang bersekolah:

III. KETERANGAN PENCACAHAN			
01	Nama dan NIP/NMS pencacah:	05	Nama dan NIP/ NMS pengawas/ pemeriksa:
02	**Jabatan pencacah:** *Staf KS Propinsi 1 Mantis 3* *Staf KS Kab/Kod 2 Mitra 4*	06	**Jabatan pengawas/ pemeriksa:** *Staf KS Propinsi 1 Mantis 3* *Staf KS Kab/Kod 2 Mitra 4*
03	Tanggal pencacahan:	07	Tanggal pengawasan/ pemeriksaan:
04	Tanda tangan pencacah:	08	Tanda tangan pengawas/pemeriksa:

*) Coret yang tidak perlu

VI. BIAYA PENDIDIKAN ANGGOTA RUMAH TANGGA BERUMUR 5-39 TAHUN YANG MASIH BERSEKOLAH

Nama: .... No. Urut: ....

1. Terdaftar dan aktif di sekolah:

SD	01	M. Aliyah	08
M. Ibtidaiyah	02	SMK	09
Paket A setara	03	Diploma I/II	10
SLTP Umum/ Kejuruan	04	Diploma III/SM	11
M. Tsanawiyah	05	Diploma IV/S1	12
Paket B setara	06	S2	13
SMU	07	S3	14

[Bila R.1=01 s.d 06, langsung ke R.3]

2. Bila R.1=07 s.d 14, jurusan pendidikan: **diisi Editor**

(................................)

3. a. Jarak terdekat yang biasa ditempuh dari tempat tinggal ke sekolah: .... Km

b. Lama perjalanannya: .... Menit

4. Sarana pergi ke sekolah:

Kendaraan bermotor yang dikuasai rt	1
Kendaraan tidak bermotor yang dikuasai rt	2
Kendaraan umum bermotor	3
Kendaraan umum tidak bermotor	4
Kendaraan orang lain gratis	5
Jalan kaki	6

5. Yang menanggung biaya tinggal/makan terbanyak:

Orang tua	1	Orang lain	4
Saudara se ayah/ se ibu	2	Sendiri	5
Famili	3	Pemerintah	6
		Yayasan/lembaga	7

6. Yang menanggung biaya bersekolah terbanyak:

Orang tua	1	Orang lain	4
Saudara se ayah/ se ibu	2	Sendiri	5
Famili	3	Pemerintah	6
		Yayasan/lembaga	7

Rincian 7 s.d 10, Hanya Untuk SD, SLTP, SMU/K

7. a. Apakah belajar di luar jam sekolah/tutorial selama catur wulan terakhir?
Ya 1 Tidak 2 ➧ **[R.10]**

b. Apakah belajar berkelompok?
Ya 1 Tidak 2

c. Apakah belajar dengan bantuan pembimbing?
Ya 1 Tidak 2 ➧ **[R.9.a]**

8. a. Bila R.7.c=1, siapa yang membimbing?
Art 1 Famili 3
Teman sekolah 2 Orang lain 4

b. Apakah membayar pembimbing?
Ya 1 Tidak 2

9. a. Tempat belajar di luar jam bersekolah:
Di dalam rumah 1 Di luar rumah 2

b. Rata-rata lama belajar di luar jam bersekolah per hari dalam seminggu: .... Jam

10. Ketersediaan buku wajib pada catur wulan yang berjalan:
Ada 1 Tidak ada 2

a. PMP	d. IPA	g. Fisika
b. Bahasa Indonesia	e. IPS	h. Kimia
c. Matematika	f. Bahasa Inggris	i. Biologi

Biaya Pendidikan Anggota Rumah Tangga

Jenis Pengeluaran	Bulan terakhir (Rp)	Selama Juli-Desember (000 Rp)
(1)	(2)	(3)
11. Pendaftaran (uang pangkal/ gedung, daftar ulang)		
12. Iuran-iuran (a + b + c + d)		
a. SPP		
b. POMG/BP3		
c. Praktikum/ketrampilan		
d. Iuran lainnya (spt. OSIS)		
13. Evaluasi/ujian		
14. Bahan penunjang mata pelajaran		
15. Seragam sekolah dan olahraga		
16. Buku, alat tulis dan perlengkapan bersekolah (a + b)		
a. Buku pelajaran/panduan/ diktat		
b. Alat tulis dan perlengkapan lainnya		
17. Transportasi (termasuk biaya antar jemput)		
18. Kursus sehubungan dengan sekolah/kuliah		
19. Lainnya		
TOTAL (11+12+13+14+15+16+17+18+19)		

APPENDIX E
HEALTH QUESTIONNAIRE FOR THE 1998 *MODULE* SURVEY

This appendix provides only relevant parts of the health questionnaire of the 1998 Susenas *Module* survey: the household characteristics section and that covering household expenditures on health. Although this survey covered health as well as education, the health questionnaire was separated from that of other topics because it contained far more detailed questions than in the past.

SU VSEN98.MKG

REPUBLIK INDONESIA
BIRO PUSAT STATISTIK

SURVEI SOSIAL EKONOMI NASIONAL 1998

KETERANGAN KESEHATAN DAN GIZI
ANGGOTA RUMAH TANGGA

sia

I. PENGENALAN TEMPAT			
01	Propinsi		
02	Kabupaten/kotamadya*)		
03	Kecamatan		
04	Desa/kelurahan*)		
05	Daerah	*Perkotaan 1 Pedesaan 2*	
06	Nomor wilayah pencacahan		
07	Nomor kelompok segmen		
08	Nomor segmen		
09	Nomor kode sampel		
10	Nomor urut rumah tangga sampel		
11	Klasifikasi desa	*Tertinggal 1* *Tidak tertinggal 2*	diisi Editor

II. KETERANGAN RUMAH TANGGA			
01	Nama kepala rumah tangga:	03	Banyaknya art umur 0 - 59 bulan:
		04	Banyaknya art berobat jalan dalam 1 bulan terakhir:
02	Banyaknya anggota rumah tangga:	05	Banyaknya art rawat inap dalam 12 bulan terakhir:

III. KETERANGAN PENCACAHAN			
01	Nama dan NIP/NMS pencacah:	05	Nama dan NIP/NMS pengawas/pemeriksa:
02	**Jabatan pencacah:** *Staf KS Propinsi 1 Mantis 3* *Staf KS Kab/Kod 2 Mitra 4*	06	**Jabatan pengawas/pemeriksa:** *Staf KS Propinsi 1 Mantis 3* *Staf KS Kab/Kod 2 Mitra 4*
03	Tanggal pencacahan:	07	Tanggal pengawasan/pemeriksaan:
04	Tanda tangan pencacah:	08	Tanda tangan pengawas/pemeriksa:

*) Coret yang tidak perlu

3

V. KETERANGAN KESEHATAN ANGGOTA RUMAH TANGGA

Nama: .... No. Urut: ....

1. Apakah pernah mengobati sendiri dalam 1 bulan terakhir? **[Cek pada Kor Blok V R.5.a]**
   Ya 1 Tidak 2 ➧ [R.3]

2. Besarnya biaya yang dikeluarkan:
   Rp ....

3. Apakah tersedia jaminan pembayaran/asuransi kesehatan untuk keperluan berobat jalan/rawat inap seperti dibawah ini?
   [Isikan kode 1 bila ya, kode 0 bila tidak]

a. Askes	d. Asuransi lain
b. Astek/Jamsostek	e. Dana sehat
c. Perusahaan/kantor	f. Kartu sehat

4. Apakah berobat jalan dalam 1 bulan terakhir?
   [Cek pada Kor Blok V R.6.a]
   Ya 1 Tidak 2 ➧ [R.7]

5. Sumber biaya berobat jalan dalam 1 bulan terakhir:
   [Isikan kode 1 bila ya, kode 0 bila tidak]

a. Rumah tangga	f. Jasa raharja
b. Askes	g. Dana sehat
c. Astek/Jamsostek	h. Kartu sehat
d. Asuransi lain	i. Surat lurah/kades
e. Perusahaan/kantor	j. Pihak lain

6. Rincian mengenai berobat jalan dalam 1 bulan terakhir: **[Cek pada Kor Blok V R.6.b]**

Pelayanan	Biaya total (dalam Rp.)	Yang dibayar rumah tangga (dalam Rp.)	Mendapat suntikan Ya 1 Tidak 2 k.(6)	Suntikan atas permintaan siapa? ART 1 Pengobat 2	Mendapat obat untuk dimakan/diminum Ya 1 Tidak 2	Kepuasan terhadap pelayanan Sangat puas 1 Puas 2 Kurang puas 3 Tidak puas 4
(1)	(2)	(3)	(4)	(5)	(6)	(7)
a. RS Pemerintah						
b. RS Swasta						
c. Praktek dokter						
d. Puskesmas						
e. Puskesmas pembantu						
f. Poliklinik						
g. Praktek petugas kesehatan						
h. Praktek pengobatan tradisional						
i. Polindes						
j. Posyandu						

7. Frekuensi konsultasi/pemeriksaan kesehatan, kir kesehatan, periksa hamil, periksa bayi sehat dalam 1 bulan terakhir:

a. RS Pemerintah	f. Poliklinik
b. RS Swasta	g. Praktek petugas kesehatan
c. Praktek dokter	h. Pengobatan tradisional
d. Puskesmas	i. Polindes
e. Puskesmas pembantu	j. Posyandu

8. Besarnya biaya yang dikeluarkan:
   Rp ....

9. Pernahkah rawat inap dalam 12 bulan terakhir?
   Ya 1 Tidak 2 ➧ [R.12]

10. Sumber biaya rawat inap dalam 12 bulan terakhir:
    [Hanya untuk art yang sudah selesai rawat inap, Isikan kode 1 bila ya, kode 0 bila tidak]

a. Rumah tangga	f. Jasa raharja
b. Askes	g. Dana sehat
c. Astek/Jamsostek	h. Kartu sehat
d. Asuransi lain	i. Surat lurah/kades
e. Perusahaan/kantor	j. Pihak lain

4

11. Rincian mengenai rawat inap dalam 12 bulan terakhir:

Pelayanan	Lama hari rawat	Biaya total (dalam Rp)	Yang dibayar rumah tangga (dalam Rp.)	Kepuasan terhadap pelayanan: Sangat puas 1, Puas 2, Kurang puas 3, Tidak puas 4
(1)	(2)	(3)	(4)	(5)
a. RS Pemerintah				
b. RS Swasta				
c. Puskesmas				
d. Rumah bersalin				
e. Pondok bersalin desa				
f. Rawat inap dukun				
g. Lainnya				

HANYA UNTUK ANAK UMUR 0-59 BULAN

12. Berapa kali anak ditimbang selama 6 bulan terakhir? .... kali

13. a. Bila R.12 ≠ 0, waktu penimbangan yang terakhir
Tanggal: .... Bulan: ....
b. Berat badan Balita menurut catatan terakhir
.... , ... kg

14. a. Tanggal penimbangan oleh petugas
Tanggal: .... Bulan: ....
b. Berat badan Balita hasil penimbangan
.... , ... kg

HANYA UNTUK UMUR 1 TAHUN KE ATAS

15. Kebiasaan sarapan pagi dalam 6 bulan terakhir
Setiap hari 1 Tidak pernah 3
Kadang-kadang 2

16. Apakah *biasa* menggosok gigi setiap hari?
[Isikan kode 1 bila ya, kode 0 bila tidak]
a. Sesudah makan c. Sesudah bangun pagi
b. Sebelum tidur malam d. Lainnya

17. Apakah pernah mendapatkan pemeriksaan dokter gigi/perawat gigi dalam 6 bulan terakhir?
Ya 1 Tidak 2 ➧ [R.19]

18. Apakah tujuan pemeriksaan tersebut?
Berobat gigi 1 Check-up 8
Pasang gigi palsu 2 Lainnya 16
Perawatan gigi 4

HANYA UNTUK UMUR 15 TAHUN KE ATAS

19. Apakah mengalami kelainan tidur dalam 1 bulan terakhir?
Ya 1 Tidak 2

20. Bila mengalami luka bakar (karena terkena api, minyak panas, air panas, benda panas) apa tindakan pertama yang harus segera dilakukan?
[Jawaban benar apabila responden menyebutkan harus secepatnya disiram/direndam air dingin beberapa menit]
Jawaban benar 1 Tidak tahu 3
Jawaban salah 2

HANYA UNTUK UMUR 30 TAHUN KE ATAS

21. Apakah dalam lima tahun terakhir melakukan general check-up (pemeriksaan kesehatan umum menyeluruh)?
Ya 1 Tidak 2 ➧ [R.23]

22. Apakah dalam general check-up tersebut dilakukan pemeriksaan laboratorium lengkap (kimia darah, urin), foto rontgen dan ECG?
Ya 1 Tidak 2

HANYA UNTUK WANITA 30 TAHUN KE ATAS
(Sebelum menanyakan pertanyaan berikut pencacah harap minta maaf dahulu)

23. Apakah mengetahui atau pernah mendengar SADARI (periksa payudara sendiri)?
Ya 1 Tidak 2 ➧ [R.25]

24. Berapa kali melakukan SADARI tersebut dalam satu tahun terakhir?
10-12 kali 1 4-6 kali 3 Tidak
7-9 kali 2 1-3 kali 4 pernah 5

25. Apakah mengetahui/pernah mendengar Tes Pap Smear (Tes Pap)?
Ya 1 Tidak 2 ➧ [Selesai]

26. Kapan Tes Pap Smear yang terakhir?
(Hanya untuk yang pernah kawin)
0-11 bulan yl 1 ≥ 36 bulan yl 4
12-23 bulan yl 2 Tidak pernah 5
24-35 bulan yl 3

APPENDIX F
QUESTIONNAIRE FOR THE 2000 EDUCATION *MODULE* SURVEY

This appendix provides only relevant parts of the questionnaire of the 2000 Susenas education *Module* survey: the household characteristics section and that covering household expenditures on education.

SUSENAS

VSEN2000.MSBP

REPUBLIK INDONESIA
BADAN PUSAT STATISTIK

SURVEI SOSIAL EKONOMI NASIONAL 2000

KETERANGAN SOSIAL BUDAYA DAN PENDIDIKAN

Rahasia

I. PENGENALAN TEMPAT			
1	Propinsi	Jawa Barat	3 2
2	Kabupaten/~~kotamadya~~*)		2
3	Kecamatan		
4	Desa/~~kelurahan~~*)		
5	Klasifikasi desa/kelurahan	*1. Perkotaan 2. Pedesaan*	
6	Nomor wilayah pencacahan		
7	Nomor kelompok segmen		
8	Nomor kode sampel		
9	Nomor urut sampel rumah tangga	3	0 3

II. KETERANGAN RUMAH TANGGA			
1	Nama kepala rumah tangga: SUHENDI	3	Banyaknya art penyandang cacat:
2	Banyaknya anggota rumah tangga: 0 3	4	Banyaknya art berumur 5 tahun ke atas yang bersekolah:

III. KETERANGAN PENCACAHAN			
1	Nama dan NIP pencacah:	5	Nama dan NIP pengawas/ pemeriksa: ANANG
2	Jabatan pencacah: *1. Staf BPS Propinsi 2. Staf BPS Kab/Kodya 3. Mantis 4. Mitra*	6	Jabatan pengawas/pemeriksa: *1. Staf BPS Propinsi 2. Staf BPS Kab/Kodya 3. Mantis 4. Mitra*
3	Tanggal pencacahan:	7	Tanggal pengawasan/ pemeriksaan:
4	Tanda tangan pencacah:	8	Tanda tangan pengawas/pemeriksa:

*) Coret yang tidak perlu

VII. KETERANGAN PENDIDIKAN UNTUK YANG MASIH BERSEKOLAH (ART 5 TAHUN KE ATAS)

25.a. Terdaftar dan aktif di sekolah:

01. SD	08. M. Aliyah
02. M. Ibtidaiyah	09. SMK
03. Paket A setara	10. Diploma I/II
04. SLTP	11. D III/Sarjana Muda
05. M. Tsanawiyah	12. D IV/S1
06. Paket B setara	13. S2
07. SMU	14. S3

[Bila R.25.a = 01 s.d. 06 ➠ R.26.a]

b. Program studi: (...) — diisi Editor

26.a. Jarak terdekat yang biasa ditempuh dari tempat tinggal ke sekolah: .... km

b. Lama perjalanan: .... menit

27. Sarana pergi ke sekolah:
1. Kendaraan bermotor yang dikuasai rt
2. Kendaraan tidak bermotor yang dikuasai rt
3. Kendaraan umum bermotor
4. Kendaraan umum tidak bermotor
5. Kendaraan orang lain gratis
6. Jalan kaki

28. Jenis olahraga yang biasa diikuti di sekolah: 1. Ya 2. Tidak

a. Senam SKJ	d. Bola kecil/kasti
b. Senam lantai	e. Bola besar/basket
c. Atletik	f. Renang

29. Apakah mempunyai kesulitan pembayaran sekolah selama Juli-Desember 1999? 1. Ya 2. Tidak

a. Uang sekolah	c. Transportasi
b. Uang buku/peralatan sekolah	d. Lainnya

30. Apakah memperoleh beasiswa/keringanan? 1. Ya 2. Tidak ➠ [R.35]

31. Sumber beasiswa/keringanan: 1. Ya 2. Tidak

a. Pemerintah/JPS	d. Lembaga lain
b. Pemerintah/Non-JPS	e. Sekolah
c. GN-OTA	f. Perorangan

32. Bentuk beasiswa/keringanan: 1. Ya 2. Tidak

a. Uang	c. Pembayaran uang sekolah
b. Barang	d. Keringanan dari sekolah

33. Besarnya uang beasiswa/keringanan per bulan:

Rp. ....

34. Bila **R.32.a** berkode 1, penggunaan uang beasiswa: 1. Ya 2. Tidak

a. Biaya sekolah	c. Jajan
b. Orang tua	d. Lainnya

35. Biaya Pendidikan Anggota Rumah Tangga:

Jenis Pengeluaran	Juli - Desember 1999 (Dalam Rupiah)
(1)	(2)
a. Pendaftaran (uang pangkal/gedung, daftar ulang)	....
b. SPP	....
c. POMG/BP3	....
d. Praktikum/ketrampilan	....
e. Iuran lainnya (seperti: OSIS)	....
f. Evaluasi/ujian	....
g. Bahan penunjang mata pelajaran	....
h. Seragam sekolah dan olahraga	....
i. Buku pelajaran/panduan/diktat	....
j. Alat tulis dan perlengkapan lainnya	....
k. Transportasi (termasuk biaya antar jemput)	....
l. Kursus sehubungan dengan sekolah/kuliah	....
m. Lainnya	....
TOTAL (R.35.a s.d. R.35.m)	....

HANYA UNTUK MURID SD/SLTP/SM

36.a. Apakah belajar di luar jam sekolah/tutorial selama catur wulan terakhir?
1. Ya 2. Tidak ➠ [R.39]

b. Apakah belajar berkelompok?
1. Ya 2. Tidak

c. Apakah belajar dengan bantuan pembimbing?
1. Ya 2. Tidak ➠ [R.38]

37. Siapa yang membimbing?
1. Orang tua/wali 3. Teman sekolah
2. Famili 4. Orang lain

38. Rata-rata lama belajar di luar jam sekolah per hari selama seminggu yang lalu:
.... jam

39. Ketersediaan buku wajib pada catur wulan yang berjalan: 1. Ada 2. Tidak ada

a. PPKn	e. IPS	i. Biologi
b. Bhs Indonesia	f. Bhs Inggris	j. Ekonomi
c. Matematika	g. Fisika	k. Sosiologi
d. IPA	h. Kimia	l. Tata negara

40. Untuk murid SD/MI, apakah mendapat makanan tambahan (PMTAS) di sekolah selama seminggu yang lalu?
Ya, berapa kali (seminggu): .... 0. Tidak

APPENDIX G

QUESTIONNAIRE FOR THE 2001 HEALTH *MODULE* SURVEY

This appendix provides only relevant parts of the questionnaire of the 2001 Susenas health *Module* survey: the household characteristics section and that covering household expenditures on health.

SUSENAS **VSEN2001.KM**

REPUBLIK INDONESIA
BADAN PUSAT STATISTIK

SURVEI SOSIAL EKONOMI NASIONAL 2001

KETERANGAN POKOK RUMAH TANGGA DAN ANGGOTA RUMAH TANGGA SERTA MODUL KESEHATAN DAN PERUMAHAN

Rahasia

I. PENGENALAN TEMPAT			
1	Propinsi		
2	Kabupaten/kota*)		
3	Kecamatan		
4	Desa/kelurahan*)		
5	Klasifikasi desa/kelurahan	*1. Perkotaan* *2. Perdesaan*	
6	Nomor blok sensus		
7	Nomor kode sampel		
8	Nomor urut sampel rumah tangga		

II. KETERANGAN RUMAH TANGGA			
1	Nama kepala rumah tangga:		
2	Banyaknya anggota rumah tangga:		
3	Banyaknya anak usia 0-4 tahun:		

III. KETERANGAN PENCACAHAN			
1	Nama dan NIP pencacah:	5	Nama dan NIP pengawas/ pemeriksa:
2	Jabatan pencacah: *1. Staf BPS Propinsi* *2. Staf BPS Kab/Kota* *3. Mantis* *4. Mitra*	6	Jabatan pengawas/pemeriksa: *1. Staf BPS Propinsi* *2. Staf BPS Kab/Kota* *3. Mantis* *4. Mitra*
3	Tanggal pencacahan: Tgl Bln	7	Tanggal pengawasan/ pemeriksaan: Tgl Bln
4	Tanda tangan pencacah:	8	Tanda tangan pengawas/pemeriksa:

*) Coret yang tidak perlu

5

V.C. KETERANGAN KESEHATAN
(UNTUK SEMUA UMUR)

17. Apakah dalam 1 **bulan terakhir** mempunyai keluhan kesehatan seperti di bawah ini? **(Bacakan dari a s.d. p)**
[Isikan kode 1 bila ada, kode 2 bila tidak]

a. Panas	☐	i. Sakit kuning/liver	☐
b. Batuk	☐	j. Sakit kepala berulang	☐
c. Pilek	☐	k. Kejang-kejang/ayan	☐
d. Asma	☐	l. Lumpuh	☐
e. Napas sesak/cepat	☐	m. Pikun	☐
f. Diare/buang2 air	☐	n. Kecelakaan	☐
g. Campak	☐	o. Sakit gigi	☐
h. Telinga berair/congek	☐	p. Lainnya	☐

[Jika semua berkode 2 ⇨ R.24]

18. Kalau ada keluhan, apakah menyebabkan terganggunya pekerjaan, sekolah, atau kegiatan sehari-hari?
1. Ya 2. Tidak ⇨ [R.21.a] ☐

19. Lamanya terganggu: .... hari ☐☐

20. Apakah sekarang masih terganggu?
1. Ya 2. Tidak ☐

21 a. Apakah pernah mengobati sendiri dalam **1 bulan terakhir**?
1. Ya 2. Tidak ⇨ [R.22] ☐

b. Jenis obat/cara pengobatan yang digunakan:
[Isikan kode 1 bila ya, kode 2 bila tidak]

1. Obat tradisional ☐ 3. Lainnya ☐
2. Obat modern ☐

c. Jika memakai **obat tradisional (R.21.b.1=1)**, buatan siapa? **[Isikan kode 1 bila ya, kode 2 bila tidak]**

1. Sendiri ☐ 3. Penjaja jamu gendong ☐
2. Pabrik ☐ 4. Lainnya ☐

d. Besarnya biaya mengobati sendiri yang dikeluarkan rumah tangga:
Rp .... ☐☐☐☐☐☐☐

22. Apakah pernah berobat jalan dalam **1 bulan terakhir**?
1. Ya 2. Tidak ⇨ [R.24] ☐

23. Rincian berobat jalan dalam **1 bulan terakhir**:

Pelayanan	Frekuensi **(Berapa kali)**	Sumber biaya **(Kode)**	Biaya yang dikeluarkan rt **(dalam rupiah)**	Kepuasan pelayanan **(Kode)**
(1)	(2)	(3)	(4)	(5)
a. RS Pemerintah				
b. RS Swasta				
c. Praktek dokter				
d. Puskesmas				
e. Puskesmas Pembantu				
f. Poliklinik				
g. Praktek petugas kesehatan				
h. Praktek pengobatan tradisional				
i. Polindes				
j. Posyandu				

24. Apakah pernah rawat inap dalam 1 **tahun terakhir**? 1. Ya 2. Tidak ⇨ [R.26] ☐

25. Rincian rawat inap dalam **1 tahun terakhir**:

Pelayanan	Lama hari rawat inap	Sumber biaya **(Kode)**	Biaya yang dikeluarkan rt **(dalam rupiah)**	Kepuasan pelayanan **(Kode)**
(1)	(2)	(3)	(4)	(5)
a. RS Pemerintah				
b. RS Swasta				
c. Puskesmas				
d. Rumah bersalin/praktek bidan				
e. Polindes				
f. Rawat inap tradisional				
g. Lainnya				

Untuk R.23 dan R.25

Kode sumber biaya (Kol. 3):
1. Rumah tangga
2. Askes/jamsostek/jasa raharja
4. Asuransi lain/perusahaan/kantor
8. Dana sehat
16. Kartu sehat/surat lurah
32. JPKM (Jaminan Pemeliharaan Kesehatan Masyarakat)
64. Pihak lain

Kode kepuasan pelayanan (Kol. 5):
1. Puas
2. Kurang puas
3. Tidak puas

6

26. Apakah tersedia jaminan pembiayaan/asuransi kesehatan untuk keperluan berobat jalan/rawat inap seperti di bawah ini? [Isikan kode 1 bila ya, kode 2 bila tidak]

a. Askes
b. Astek/Jamsostek
c. Perusahaan/Kantor
d. Asuransi lain
e. Dana sehat
f. Kartu sehat
g. JPKM

27.a Frekuensi konsultasi/pemeriksaan ke kesehatan, periksa hamil, periksa bayi sehat dalam 1 bulan terakhir?

1. RS Pemerintah
2. RS Swasta
3. Praktek dokter
4. Puskesmas/Pustu
5. Poliklinik/Lab
6. Praktek petkes
7. Praktek batra
8. Polindes/Posyandu

b. Jika salah satu R.27.a.1 s.d. 8 isiannya ≠ 0, berapa besarnya biaya konsultasi yang dikeluarkan rt:

Rp ....

V.D. KESEHATAN BALITA (ANAK UMUR 0-59 BULAN)

28. Umur: .... bulan

29. Siapa yang menolong proses kelahiran?
1. Dokter
2. Bidan
3. Tenaga paramedis lain
4. Dukun
5. Famili/Keluarga
6. Lainnya

Pertama a.
Terakhir b.

30. Apakah pernah dibawa ke Posyandu dalam 1 tahun terakhir?
1. Ya, kurang dari 1 bulan yang lalu
2. Ya, antara 1-2 bulan yang lalu
3. Ya, lebih dari 2 bulan yang lalu
4. Tidak ➩ [R.32]

31. Pelayanan pada kunjungan terakhir:
1. Penimbangan
2. Imunisasi
4. PMT/vitamin/oralit
8. Pengobatan
16. Konsultasi
00. Tdk memperoleh pelayanan

32.a. Apakah pernah diberi Air Susu Ibu (ASI)?
1. Ya 2. Tidak ➩ [Jika R.28 > 11 bulan ke art lain]

b. Jika R.32.a=1, lamanya: .... bulan

UNTUK ANAK UMUR 0-11 BULAN

33. Apakah diberi ASI dalam 24 jam terakhir?
1. Ya 2. Tidak

34. Apakah kemarin/tadi malam anak diberi makanan atau minuman ini: [Isikan kode 1 bila ya, kode 2 bila tidak]

a. Susu bubuk bayi
b. Air/teh/tajin
c. Buah
d. Biskuit bayi
e. Bubur tepung beras
f. Bubur susu
g. Nasi tim/bubur beras+sayur
h. Nasi tim/bubur beras+lauk hewani/nabati+sayur
i. Lainnya

V.E. KEBIASAAN MEROKOK (ART UMUR 10 TH KE ATAS)

35. Apakah merokok dalam 1 bulan terakhir?
1. Ya ➩ [R.37] 2. Tidak

36. Apakah pernah merokok sebelumnya?
1. Ya ➩ [R.39]
2. Tidak ➩ [Blok V.F atau art lain]

37. Jika R.35=1 berapa batang rokok yang dihisap dalam 24 jam terakhir? .... batang

38. Apakah biasa merokok di dalam rumah ketika sedang bersama art lain?
1. Ya 2. Tidak

39. Pada usia berapa mulai merokok? .... th

V.F. FERTILITAS & KELUARGA BERENCANA

WANITA PERNAH KAWIN UMUR ≥10 TH (Blok IV, Kolom 4=2, Kolom 6=2, 3, 4)

40. Umur pada saat perkawinan pertama: .... tahun

41. Jumlah tahun dalam ikatan perkawinan: .... tahun

42. Jumlah anak kandung (a.k.) yang dilahirkan:	Lk	Pr	Lk+Pr
a. A.k. lahir hidup			
b. A.k. masih hidup			
c. A.k. sudah meninggal			

43. Pernah menggunakan/memakai alat/cara KB?
1. Ya 2. Tidak ➩ (Art lain)

WANITA BERSTATUS KAWIN UMUR ≥10 TH

44. Apakah sedang menggunakan/memakai alat/cara KB?
1. Ya 2. Tidak ➩ (Art lain atau Blok VI)

45. Alat/cara yang sedang digunakan/dipakai:
1. MOW/tubektomi
2. MOP/vasektomi
3. AKDR/IUD/spiral
4. Suntikan KB
5. Susuk KB/norplan/implanon/alwalit
6. Pil KB
7. Kondom/karet KB
8. Intravag/tissue/kondom wanita
9. Alat/cara KB tradisional ➩(Art lain/Blok VI)

46. Tempat memperoleh alat/cara KB yg terakhir:
01. RS Pemerintah
02. RS Swasta
03. Praktek dokter
04. Puskesmas/Pustu
05. Poliklinik
06. Praktek bidan
07. Polindes/BDD/Posyandu
08. PLKB
09. PPKBD/Pos KB
10. Apotik/toko obat
11. Lainnya

47. Biaya yang dikeluarkan untuk memperoleh pelayanan KB yang terakhir:

Rp ....

10

VII. PENGELUARAN RUMAH TANGGA (LANJUTAN)		
VII.B. PENGELUARAN BUKAN MAKANAN (BERASAL DARI PEMBELIAN, PRODUKSI SENDIRI DAN PEMBERIAN)	Sebulan yang lalu (Rp)	12 bulan yang lalu (Rp)
(1)	(2)	(3)
17. **Perumahan dan fasilitas rumah tangga** (sewa, perkiraan sewa rumah sendiri, rekening listrik, rekening telepon, gas, minyak tanah, air, kayu, dll.)		
18. **Aneka barang dan jasa** (sabun mandi, kecantikan, pengang-kutan, bacaan, pembuatan KTP/SIM, rekreasi, kartu telepon, benda pos, dan lainnya)		
19. **Biaya pendidikan** (uang pendaftaran, SPP, POMG/BP3, uang pangkal/daftar ulang, pramuka, prakarya, kursus, dan lainnya)		
20. **Biaya kesehatan** (rumah sakit, puskesmas, dokter praktek, dukun, obat-obatan, dan lainnya)		
21. **Pakaian, alas kaki, dan tutup kepala** (bahan pakaian, pakaian jadi, sepatu, topi, sabun cuci, dan lainnya)		
22. **Barang tahan lama** (alat rumah tangga, perkakas, alat dapur, alat hiburan, alat olahraga, perhiasan mahal/imitasi, kendaraan, payung, arloji, kamera, pasang telepon, pasang listrik, dll.)		
23. **Pajak dan asuransi** (PBB, iuran TV, pajak kendaraan, asuransi kecelakaan/kesehatan)		
24. **Keperluan pesta dan upacara** (perkawinan, khitanan, ulang tahun, perayaan hari agama, upacara adat, dan lainnya)		
25. **Jumlah bukan makanan** (Rincian 17 s.d. Rincian 24)		
26. **Rata-rata pengeluaran makanan sebulan** (Rincian 16 $\times \frac{30}{7}$)		
27. **Rata-rata pengeluaran bukan makanan sebulan** $\frac{\text{(Rincian 25 Kolom 3)}}{12}$		
28. **Rata-rata pengeluaran rumah tangga sebulan** (Rincian 26 + Rincian 27)		
29. **Sumber penghasilan utama rumah tangga:** **(Tulis selengkap-lengkapnya)** Isikan kode lapangan usaha/penerima pendapatan dan status pekerjaan sesuai sumber penghasilan utama rumah tangga dalam kotak. Tiga digit pertama untuk kode lapangan usaha/penerima pendapatan dan satu digit terakhir untuk kode status pekerjaan **Kode status pekerjaan:** 1. Buruh/karyawan 2. Pengusaha		**diisi Editor**

STAT PROJECT SUMMARY REPORT

Report # 70

by

Yahya Jammal

June, 2003

Statistical Assistance to the Government of Indonesia (STAT) Project
USAID Contract No. PCE-I-00-99-00009-00

FOREWORD

The Statistical Assistance to the Government of Indonesia (STAT) project began in March 2000 and is ending in June 2003. During these three years, the project forged a very close partnership with BPS, which was crucial to its success. The report summarizes the project's main activities, draws some lessons which hopefully will be heeded in the design of similar activities in the future, and suggests a desirable path for future cooperation between USAID and BPS. This report is intended for both USAID and BPS and is written with that in mind.

I would like to thank USAID for its financial support, which made possible the tangible outputs and the capacity building that the project has accomplished. BPS has also thrown its full weight behind all project activities. The project benefited from contributions and participation of dozens of its officials, at the senior, middle and lower management levels as well as at the staff level. These individuals are too numerous to mention here individually. I just would like to convey my sincere appreciation of their support and deep gratitude to them.

TABLE OF CONTENTS

I. INTRODUCTION

The STAT project was designed by USAID in late 1999, following Indonesia's severe economic crisis in 1998. With economic policy makers and donors attempting to navigate through tough economic conditions, and working frantically to devise measures to help the country recover from that crisis, BPS was under considerable pressure to produce more timely economic indicators, particularly on the macroeconomy. Limitations of various economic statistics long published by BPS, which would have been addressed in a calm and objective way under normal circumstances, were brought to the fore publicly and in some cases one might say even passionately. Doubts about the accuracy and reliability of important indicators (the consumer price index, the national accounts, the poverty measure, for example) were being expressed publicly as well as privately; with some observers accusing BPS of "cooking" these numbers for political ends. In sum, the project was conceived at a time when BPS was under great pressure to produce adequate prompt macroeconomic indicators and to convince users of their reliability.

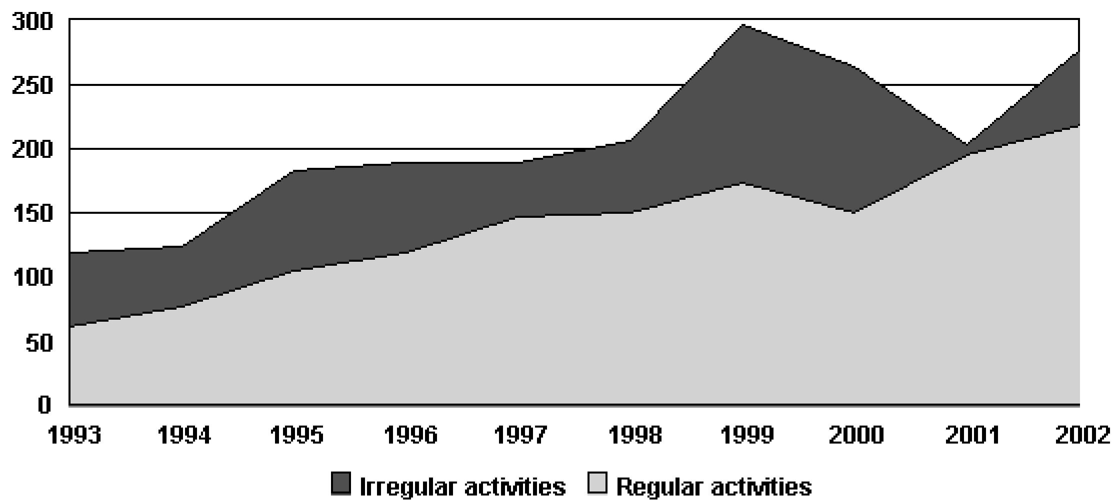
The need for quick action in getting a project started to assist BPS prompted USAID to quickly put together a Request For Proposal (RFP) which was a collection of ideas representing wishes for assistance expressed by BPS at the time. Although the RFP's primary emphasis was on the macroeconomy, it covered a broad spectrum of activities: census/survey methodology, prices, labor market, agriculture and organization/management. With the exception of demographic/social statistics, activities under this RFP covered nearly all the areas in which a centralized statistical agency such as BPS is involved. Since USAID did not have the time to develop a comprehensive and consistent framework, it was up to the project to concentrate on the specific areas that it believed were most appropriate.

The above remarks in no way discredit BPS's or USAID's actions; rather, they provide perspective on the circumstances under which this project was conceived. Without fully understanding this, one cannot adequately grasp the extent of the project's achievements in the last three years.

How did things get to this point during the crisis? After all, wasn't BPS one of the success stories among developing countries in the past? BPS is unique among statistical agencies in developing countries for nurturing statistical skills at an early age through its academy, with its highly selective admissions policy of high school students. Since the 1960s, it has established a solid reputation for the high caliber of its technical and operational capabilities. By the 1980s, few developing countries, if any, could match its record in the number of regular censuses (population, economic, agriculture and industry), large-scale surveys (such as Susenas, the national socio-economic survey and Sakernas, the national labor force survey) and complex statistical products such as input-output tables and social accounting matrices. And that for one of the world's most populous and diverse countries. Within Indonesia, BPS enjoyed a reputation of having some of the more skilled technical staff in government. Its profile was generally low key and the institution was generally perceived as a competent independent technical agency.

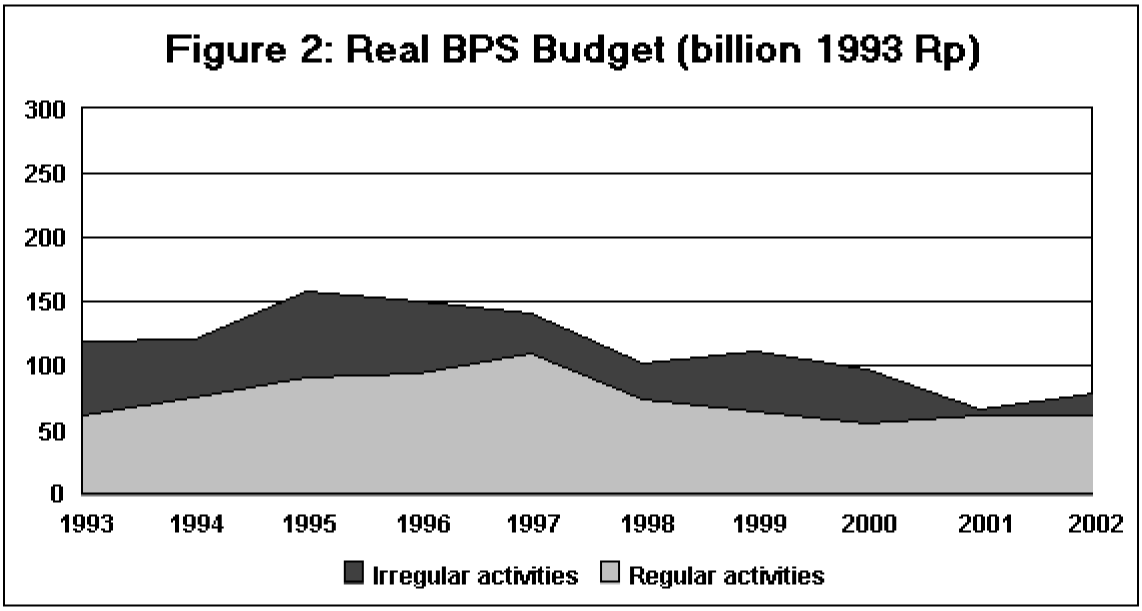
Unfortunately, two developments during the 1990s adversely affected BPS. The first was the significant budget tightening since the economic crisis. Despite the more or less steady increase in its nominal budget for regular activities[1] since 1993 (shown in Figure 1), real expenditures[2] have shown a steady decline since 1997 (Figure 2). The average annual growth in nominal expenditures between 1997 and 2002 was about one third that of the 1993-1997 period, pulling corresponding real expenditures in 2002 back to levels similar to those of 1993.

Figure 1: Nominal BPS Budget (billion Rp)



[1] "Regular" activities in this report are defined as those activities which are undertaken regularly (e.g. national accounts, monthly CPI, annual Industry surveys, Susenas etc.), unlike the occasional (or "irregular") activities like censuses (population, agriculture, economic) conducted once every 10 years or *ad hoc* surveys. The budget for "regular" activities in the graphs includes all expenditures, not only those referred to in the official government budget as "routine."

[2] Nominal expenditures were deflated by the implicit government expenditure deflator in the expenditure accounts.



The second important development, paradoxically, was the great advance in computer technology that resulted in increasing sophistication of users by the 1990s. This has increased the quality and competence of user analysis. The gap in technical skills between BPS staff and outside users, which had favored BPS staff until the 1980s, narrowed substantially with users' access to micro data and powerful computing capabilities by the 1990s. This gave them greater competence in questioning the reliability of published BPS data. By 2000, some users were publicly questioning the reliability of particular data series. BPS's inadequate response on these issues encouraged accusations of political motivation behind certain data and the perception of its independence began to be questioned.

This was the environment in which the project began. The project's main objective was to work together with BPS to help it to reestablish an image of a competent, independent statistical agency that produces adequate statistics for its users.

II. ACHIEVEMENTS

A. Our Approach

With a clear objective in mind, the project's approach was straightforward:

- First, **help BPS develop *relevant* data** (in the areas stated in the RFP), with the appropriate mix of accuracy and timeliness that available resources allowed. This, in turn, required several steps: asking the right questions, building systems that provided the right answers and promoting transparency of design and computations.

- Second, **help improve user *understanding* of the data**: the best way to achieve this was through documentation of sources and methods and their continual dissemination to various user groups.

- Third, **ensure sustainability of the whole process**, which involved three stages:

  a. <u>System/method development</u>: during this stage, project advisors were expected to spend the largest share of time, with local staff working closely with them but providing primarily a supporting function.

  b. <u>System/method maintenance</u>: during this stage, the primary operation of the system/method would become the responsibility of the local staff. The project advisor's responsibility would be limited to that of ensuring plausibility of results and helping to solve minor problems that may arise in day-to-day operation.

  c. <u>Full institutionalization</u>: during this stage, the system/method would have been fully captured and owned by the responsible BPS division. The project expert would play a minor role, only that of advisor on particular issues that may arise from time to time.

This has been the primary pattern of involvement of the project in various areas covered.

It was done within the context of a new strategic vision that BPS needed to articulate. In the face of the new realities, BPS needed to recognize the fact that it no longer possessed a monopoly over the production of statistics, and that the continuing tight future budgets would require a reevaluation of the net benefits of every statistical activity in which it was involved. Operationally, BPS needed to group its statistical activities into three broad categories:

- **activities in which accuracy is critically important**. These include nationwide censuses: population, agriculture, economic. For these activities, BPS is, and is likely to remain, a monopolist given the substantial resources (technical, financial and human) necessary to produce them. Operationally, these activities can continue to be conducted in the way they have been in the past (i.e. using the current rigid multi-level regional structure).

- **activities in which timeliness is critically important**. These include surveys where delays make them far less useful (and for long delays, nearly useless) to users. Examples of such surveys are: the monthly consumer price index, the monthly/quarterly industrial production index, the consumer expectations survey and the business expectations survey. With these surveys, BPS is likely to face strong competition, from other government agencies (eager to produce prompt indicators for their own uses) as well as from the private sector. These products require a more flexible structure than BPS had used in the past (e.g. a structure similar to that developed for the monthly manufacturing production survey). Use of phones, faxes, email and web questionnaires will need to be explored. In certain cases, if BPS cannot compete, it may need to opt out of conducting such surveys.

- **all other activities**, which cover cases where both accuracy and timeliness are important to varying degrees. Examples include large-scale activities (such as quarterly national accounts, Susenas and Sakernas), as well as smaller-scale activities. In delivering such products, BPS may face some competition. Operational structure will need to be somewhere between the above two types of activities.

The project believed that BPS needed to evaluate its existing activities, focusing on those in which it had a comparative advantage and a competitive edge and devising new ways to fulfill user demand in surveys where timeliness is of the essence. Structural **flexibility** would be key to its future success: some products would continue to demand the highly rigid bureaucratic structure currently in place, but others would require conducting work directly from the head office in new ways. The project worked together with various BPS divisions to help steer the organization onto this path, and was successful in producing the tangible outputs described in the next section.

B. Tangible Outputs

Tangible outputs produced by the project all of which, it should be emphasized, were the joint effort of project advisors and BPS staff, include the following:

- **Development of the non-oil manufacturing industrial production index**. Such an activity had been a requirement for Indonesia's compliance with the IMF's Special Data Dissemination Standards (SDDS). The system contains a monthly sub-system designed to provide a prompt indicator (i.e. available with a six-week lag) at the 1-digit International Standard Industrial Classification (ISIC) level, and a slower quarterly indicator at the 3- and 2-digit ISIC levels. The system has been operational since 2000 and its results have been regularly published by BPS on its website and in *Indikator Ekonomi*. Completion of this system was one of the rare cases where BPS received an open acknowledgment from a recognized outside authority that it had achieved its target.[3] As of this writing, the Industry Directorate, which is responsible for this activity, has converted the whole survey into a single monthly system, which should provide users with disaggregated data more frequently and more promptly. In addition, the Directorate has begun to make available to users monthly employment indices derived from this survey. Results for 1993-2000 were provided in a separate BPS publication.[4]

- **Design of an expanded industrial production index** including non-oil manufacturing as well as mining, electricity, gas and water. By integrating the results of the non-oil manufacturing production survey with monthly data on oil, gas, other minerals and electricity, the new index should provide a more complete indicator of non-farm goods activity. BPS is currently computing this index although results have not yet been published.

- **Documentation of the computation of the national accounts**. This was the first known attempt at documenting the sources and methods used by BPS to compute Indonesia's national accounts. Write-up of this document followed years of complaints by outside users that these computations lacked transparency. Documentation was believed to be the most effective way of transmitting to users how figures had been computed over time and the myriad sources and ways that need to be followed to ensure regular production of these figures.

- **Design of a system for computing unit value indices for exports and imports of goods**. Work in this area was prompted by a discovery of substantial weaknesses in the foreign trade deflators that had been used by BPS. A new methodology was designed which resolved the two main problems which appear when using unit values: heterogeneity and inaccuracy. Results for 2000-2001 using the new system have been documented in a special BPS publication.[5]

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[3] Success in producing this index was acknowledged by the IMF's Statistics Department in a congratulatory email to the Indonesian government dated November 6, 2001: "Congratulations on the significant improvement of the production index. The dissemination of the production index is now in observance with the SDDS's requirements in terms of periodicity and timeliness. The announcement of the improvement has been made on IMF SDDS web page as follows:

> Completed transition plan
> Indonesia: The periodicity and the timeliness of the data on the Production index has been brought into observance of the SDDS. Indonesia now fully meets the SDDS requirements for this data category."

[4] *Production and Employment Indices of Large and Medium Manufacturing: 1993 - 2001*, October, 2001.

[5] *Unit Value Indexes for Exports and Imports: January 2000 - April 2002*, July, 2002.

- **Design of a system for direct measurement of inventory changes in the national accounts**, instead of their derivation as a residual between total production and final sales, as has been the case to date. One advantage of introducing this methodology was that the inventory change estimates themselves would improve. When they are residuals, they reflect not only actual inventory change, but also errors in measuring production and final sales. Improved estimates based on direct measurement should also enable a better understanding of the magnitude and the timing of inventory change in economic fluctuations. Perhaps even more important was the potential advantage of improving estimates of private consumption, the largest component of final expenditures. BPS is currently computing these figures and plans to publish a 1993-2001 historical series soon.

- **Design of a methodology to measure Indonesia's Income Accounts**. Income accounts for Indonesia for 1990-2000 were computed, for the first time, and documented in a special project report. These accounts can hopefully be regularly updated by BPS in the future.

- **Introduction of seasonal adjustment and benchmarking techniques**. These statistical techniques, which help improve existing statistics, were applied widely within BPS, to data in national accounts, industrial production, prices and some statistics derived from Susenas, the national socio-economic survey. Benchmarked industrial production indices are now a routine activity, which began with a special BPS publication covering the 1993-2001 period.[6]

- **Design of a quarterly labor force survey system**. The survey was designed to provide a quarterly measure of unemployment at the national level with consistent annual measures of unemployment at the provincial level. The survey was implemented by BPS for the 2002 period.

- **Introduction of a new "relaxed" definition of unemployment**. Such a measure would be highly appropriate for Indonesia. It would take into consideration the impact of what is referred to as "discouraged workers." Our evaluation showed that such workers represented a significant phenomenon in Indonesia, particularly since the crisis. Treating them as part of the unemployed in the civilian labor force made a substantial difference, not only nationally, but by gender, urban/rural location and province as well.

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6 *Benchmark Production and Employment Indices of Large and Medium Manufacturing: 1993 - 2000*, October, 2001.

- **Design of a methodology for improving measurement of rice production**. An evaluation of the current methodology used by BPS for estimating rice production, namely reliance on the crop-cutting approach, suggested that the methodology had substantial shortcomings. A supplemental methodology, relying on regular household surveys, was proposed.

- **Improving estimation procedures of a large-scale small business area survey**. The current survey designed to cover non-registered establishments (known by its acronym SUSI), which forms the basis for data covering small establishments in industry, trade and services, was evaluated and a revised set of estimation procedures was designed. These procedures were necessary to ensure that the final tabulated results provided an adequate representation by province and economic sector.

- **Design of a questionnaire for a web-based survey**. The weekly foreign exchange rate survey was selected as a model for possible future BPS activities in which timeliness is of critical importance. It was chosen because of its simplicity, its moderate input volume and because it contained most of the features necessary for expansion to other BPS activities in which interactive questionnaires can potentially be used.

All the above systems and methods have followed, to varying degrees, the three-step approach described in Section II.A above, and by now have been fully institutionalized. All have also been documented in project reports. In addition, the project produced information papers for outside users in the following areas:

- a review of employment and earnings statistics sources,
- the introduction of new coded data on commodities used and produced in the annual manufacturing survey,
- the introduction of the chain linking methodology to the national accounts,
- an evaluation of the current measures of production and consumption of rice,
- an evaluation of the claim of understatement of rice consumption in Susenas,
- an evaluation of a quarterly wage survey of livestock and fishery, which has not yet been published and
- the result of benchmarking health and education expenditure data in Susenas.

Overall, the project has produced seventy reports (listed in Table A.1 of Appendix A). Some of these were progress reports, some were papers aimed at outside users and some were aimed at users within BPS. Papers which were aimed primarily at outside users for wide public distribution, referred to as project “statistical papers”, have been placed on the BPS website as they have been produced. Nineteen such papers were produced and are listed in Table 1 below.

Table 1
STAT Statistical Papers Aimed at Outside Users

Author	Title	Date
Hananto Sigit	Employment Data in Indonesia	Aug 00
Hananto Sigit	Earnings Data in Indonesia	June 00
Yahya Jammal	Revision of Quarterly Production Accounts	Oct 00
Yahya Jammal/Rosniaty Ismail	The Monthly Manufacturing Production Survey	Nov 00
Yahya Jammal	Quarterly National Accounts in Indonesia: Current Sources and Methods (Draft)	Feb 01
Vijay Verma	Selected Issues in Labor Force Statistics	Mar 01
Vijay Verma	Agricultural Census and Surveys	Mar 01
Yahya Jammal/Vijay Verma	Monthly Manufacturing Production and Employment Indices	Apr 01
Yahya Jammal	Chain Linking National Accounts	June 01
Uzair Suhaimi/Yahya Jammal	Measuring Open Unemployment in SAKERNAS	June 01
Frank de Leeuw	Unit Value Indexes for Exports and Imports	July 01
Yahya Jammal/Rifa Rufiadi	Classifying Manufacturing Production by Commodity vs by Establishment: Evidence Using 1998 Annual Survey Data	Aug 01
Frank de Leeuw	Measuring Changes in Inventories in Indonesia	Sep 01
Frank de Leeuw	An Expanded Industrial Production Index for Indonesia	Feb 02
Suwandhi Sastrotaruno / Choiril Maksum	Aggregate Rice Data in Indonesia: A Brief Overview	Feb 02
Kusmadi Saleh/Yahya Jammal	Toward Income Accounts for Indonesia	Sept 02
Yahya Jammal/Arizal Ahnaf	Is Susenas Rice Consumption in Urban Areas of Indonesia Understated?	Nov 02
Yahya Jammal/Uzair Suhaimi	Quarterly Wage Survey of Livestock and Fishery	Apr 03
Yahya Jammal/Wendy Hartanto	Benchmarking Susenas Health and Education Data	May 03

These papers have generated visible interest from outside users. The project's initial monitoring of the website activity suggested that many of these papers were being downloaded by outside users, some at an average rate of two per day for several months. User interest was also demonstrated when, in response to a request from the editor of the *Bulletin of Indonesian Economic Studies*, a note was written in that bulletin for the benefit of its readers, who constitute an important group of users of BPS data. The note, which will appear in a forthcoming issue and is provided in Appendix B, contains a brief abstract of all except the last two papers in Table 1. Such interest is a clear validation of the relevance, quality and usefulness of these papers.

C. Capacity Building

I believe that capacity building is one of the most important building blocks, perhaps the most important, for ensuring sustainability of a technical assistance activity. Without it technical assistance may simply perpetuate dependence rather than promote self-reliance. This has been a primary emphasis of the project, despite its absence from the RFP.

Capacity building in this project has been an on-going daily activity taking two broad forms:

- **skill upgrading**, covering: basic statistics, data design, sampling, data evaluation, questionnaire design, frame/survey design, national accounting and statistical adjustment techniques.

- **introducing procedural improvements**, including better service to users and flexible organizational structures for surveys.

In performing this task, the project had the enviable position of the full support of a highly committed BPS leadership, which allowed project advisors to work with staff at every level and to get things done even under difficult circumstances. That was accomplished despite the constraint of not being able to hire any BPS staff for pay. Some of the lessons learned from this experience are described in Section III below.

The best evidence of the true partnership between the project and BPS is the latter's "ownership" of all project outputs as evidenced by the two volumes of statistical papers that the institution is making available to its major users and to all its regional offices (see Section II.C.2 on dissemination below). Such success was in no way a simple matter. In order to achieve it, the project discovered that it was necessary to work on three different levels simultaneously: senior management, middle management and staff. Concentration on only one of these levels, regardless of which one, would not have been sufficient. Staff commitment was critical for development and sustainability of every activity, senior management provided the legitimacy and middle management freed up the necessary resources, human and physical, to do the job.

Moreover, BPS itself benefitted from the close relationship that the project built with various divisions. The project played the role of catalyst, for example, in bringing together the methodology and subject matter directorates as well as the national accounts and other subject matter directorates. In the past, cooperation between these directorates, although required on paper, was very limited in practice for various bureaucratic reasons. By distributing project reports documenting methodologies and computations, staff in various sub-directorates were able to know how their numbers were being utilized within BPS. And by trying to spread sampling skills to various subject matter sub-directorates, the project was able to foster closer links between the Methodology Directorate (which is responsible for sampling issues within BPS) and other directorates which draw and use samples.

This in a nutshell summarizes the progress made on the capacity building side. The sections below provide more detail in the three particular areas of training, data dissemination and hardware/software:

1. Training

Informal training was the main vehicle utilized by the project to increase skill levels in all the systems and methods developed and described in Section II.B above. This took several forms:

- **on-the-job work** on all the systems and methods which have been developed.

- **participation in project reports**. Several statistical papers in Table 1 were co-authored by project advisors and BPS officials. Several lower-level staff members also contributed substantially to producing particular project reports. Their contributions were duly acknowledged in these reports. Coaching them in research and data evaluation methods proved very valuable to many, who were willing to put in significant time for this work despite the absence of monetary rewards.

- **gradual phase-in of presentations conducted by BPS officials**. Project presentations in the beginning were conducted solely by expatriate advisors. Gradually, such presentations began including BPS staff. In the past year, project-sponsored presentations were conducted solely by coached BPS staff with project involvement limited to logistical, technical and presentational support.

One-off formal training programs are generally less effective than on-the-job training. Nevertheless, such training vehicles have their uses. Several such programs were conducted in the past three years by the project:

- Four BPS staff were sent to 3-4 week training programs at the US Bureau of Labor Statistics in Washington, DC.

- One intensive 3-day training seminar on basic sampling techniques was conducted for 12 staff from 10 directorates and the statistics academy.

- Staff of relevant subject matter sub-directorates were provided training (usually in half-day sessions) on particular statistical methodologies including: benchmarking, seasonal adjustment, stratification, estimation procedures and selected national accounting techniques.

The emphasis of such training was primarily on skill upgrading of staff up to the level of section chief, rather than on managers (at the sub-directorate chief level or above), because that was where the greatest need was. Overall, the number of beneficiaries of training by the project (whether formal or informal) was 20 out of the 100 section chiefs in technical sub-directorates of the BPS head office and 80 out of the 400 or so staff in these sub-directorates (about 20%).

2. Data Dissemination

The project's strong belief, and that of BPS, is that data are only useful when they are in the hands of users when they need them. Ensuring that whatever data are produced are disseminated as promptly as possible is a major objective of any statistical agency. The project also believed that it could further help BPS in this regard by setting important precedents. Hence the use of the following vehicles for various project outputs:

- **Distribution of project reports**: for statistical papers listed in Table 1, an average of 36 copies per paper were distributed to users (with a minimum of 16 and a maximum of 67). For other reports, which were not aimed at outside users, the average number of copies distributed per report was 16 (with a minimum of 7 and a maximum of 41). These numbers are biased downwards, as they only include cases that were recorded when reports were first distributed. Many requests for additional copies were subsequently made but may not have been recorded. A substantial proportion of the circulation has been to relevant users within BPS as well. Outside BPS users on the project distribution list include government agencies (Bappenas, Ministry of Finance, Bank Indonesia, Ministry of Industry and Trade, Ministry of Manpower, Ministry of Agriculture, national parliament), universities and donors.

- **Placing papers on the BPS website**: all 19 statistical papers in Table 1 have been placed on the BPS website as they have been produced. As mentioned above, many have been regularly downloaded by outside users.

- **User workshops**: the project funded three such workshops:

  a. one on small industry and the informal sector (in September 2001),
  b. one on the Agriculture census preparations (in April 2002) and
  c. one on data dissemination using the internet (in September 2002)

- **a forthcoming note in the *Bulletin of Indonesian Economic Studies*** providing an abstract on most project statistical papers. Appendix B provides the text of the note.

- **a special joint BPS-Project volume in English** containing all the project statistical papers. This volume, which is aimed at national policy makers, researchers and donors had about 70 copies distributed.[7]

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7 These were given to donors (USAID, the World Bank, UNDP, ILO, UNIDO, IMF and the Asian Development Bank), a number of government agencies (Bappenas, Bank Indonesia, Ministry of Finance, Ministry of Industry and Trade, Ministry of Manpower, Ministry of Cooperatives and Small Enterprises and national parliament) and LPEM at the University of Indonesia.

- **a special joint BPS-Project volume in Indonesian** containing most statistical papers. This volume is aimed at users in the regions. About 500 copies have been distributed primarily to the BPS kabupaten and provincial offices.

3. Hardware/software

In order to reach the tangible and intangible achievements mentioned in this report, it was necessary for the project as well as BPS to have the right tools in terms of hardware and software. Fifty computers were purchased by the project and made available to 24 BPS sub-directorates. These gave badly needed computing capability to many sub-directorates and were responsible for unleashing latent demand for the acquisition of highly useful statistical techniques. In addition to the hardware acquired, the project provided several software packages to BPS covering: networking, website management, automated variance estimations, utility programs, SAS[8], word processing/spreadsheet and encryption.

III. LESSONS LEARNED

A. Think Long Term

Statistical development can best be compared to infrastructure development: it provides tools (or means) that people can use for their particular needs. It has three basic characteristics:

- First, its outputs usually have long gestation periods. Identifying relevant data for policy, building systems capable of producing them, testing, evaluating and refining these systems, regular production of final data and institutionalization of the full set of activities require years of focused and sustained effort. Their true impact can only be seen many years after their completion. Quick fixes generally do not provide adequate solutions.

- Second, adequate solutions to particular problems generally cannot be found by simply copying them from more developed countries. This is because both financial and human resources available in those countries are far more than statistical agencies of developing countries can afford to devote. The challenge is then to develop adequate solutions tailored to the unique circumstances of the particular institution or country.

- Third, it requires a substantial capacity building component to ensure sustainability.

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[8] This statistical package was leased, rather than purchased, for the duration of the project.

Statistical development, therefore, is best addressed when looked at as a long-term process with its value realized over many years and sometimes decades. Unfortunately, this is not the usual perspective of policy makers or donors, which often tends to be short-term. Although opportunities to do something about statistical development may open up during or following crises (as was the case with this project), hopefully, neither policy makers in Indonesia nor donors will have to wait until the next crisis to make sure that good data are produced.

B. Understand Existing Incentive System

To be truly effective, technical assistance requires a good understanding of how the incentive system within the counterpart organization works. In other words, it is imperative to find out how counterparts can be motivated to do particular tasks. That takes time, but without a good understanding of that system, which may be perverted by vested interests, one cannot ensure that effective measures are taken to achieve stated objectives.

It would be simply stating a well-recognized fact if one said that civil servants in Indonesia face considerable financial pressure. Because their salaries are very low, moonlighting is very common and attempts to supplement their salaries abound. Various ways have been devised over time to supplement salaries, including honoraria for participating in special meetings, seminars and multitudes of committees, in addition to the per diems paid for field trips. So the average eligible civil servant understandably tends to maximize involvement in such activities, a practice which can potentially provide several multiples of the basic salary.

Such pressure should not be underestimated. It is a very serious one, and cannot simply be brushed aside by claiming that only those lacking technical skills, or those susceptible to corrupt practices, are subject to it. Even highly competent people, and those truly interested in developing their institution, sometimes have no choice but to succumb to it. That pressure is also the root cause of another problem that donors often complain about: lack of adequate counterparts. Sometimes it is not lack of counterparts with the relevant skills and responsibility that is the problem, but the willingness of such competent counterparts to devote the necessary time to do the job when their opportunity costs are so high.

As civil servants, BPS employees face these pressures. USAID, on the other hand, forbids payments to civil servants of any supplement to their salary. That is understandable in principle because one does not want to encourage people to expect salary supplements for performing their regular duties. So one faces a serious dilemma: on the one hand we have to motivate qualified, well-meaning, eager-to-learn counterparts to cooperate and perform but at the same time we cannot compensate them with pecuniary supplements. That is not easy, particularly where opportunity costs are high, and when other donors compete for their time and find ways to compensate them financially.

The project relied on non-pecuniary incentives to get things done, with some success, although progress was frustrated at times by our inability to use pecuniary incentives. Close association with the project did provide some of the staff with valuable non-pecuniary incentives, including recognition by peers and superiors, increased responsibility, participation in prestigious programs, skill improvement and access to the latest technology or literature. To our great surprise, one incentive that we discovered and used effectively with younger staff was helping them to acquire English language skills. Demand for basic English language material was high in that group. Since the project could not pay for language instructors, I was distributing my children's leftover school books to the staff that were helping us in various activities. Over the project's three years, about 150 such books have found their way through various staff and are being circulated. The project has learned that people are now sharing them and passing them around. This was a pleasant motivating tool that the project used to great effect.

Although non-pecuniary incentives are more difficult to establish initially, they tend to provide a far more lasting effect. Nevertheless, certain conditions may limit their effectiveness. The more underpaid counterparts feel, the higher the temptation of money; and the more one donor throws money at them, the more it undermines the strategy and effectiveness of other donors.

C. Do Not Underestimate Importance of Inter-personal Skills

Effectiveness, especially in capacity building, often depends more on inter-personal skills (credibility, ability to communicate, adaptability) than on pure technical skills. Yet, foreign advisors are often recruited based almost exclusively on their technical skills. When scopes of work include such attributes, it is usually in passing, while the emphasis (and the scoring in selecting advisors) is almost exclusively placed on technical skills. This project's RFP is one example.

While technical competence is a necessary condition for adequate performance, it is often not sufficient. In fact it is sometimes less important than personal skills, which are often very important in allowing the advisor to ask the right questions and get the right answers. These skills, if brought to bear, would allow the advisor to: treat counterparts and be treated by them as a partner, not as a "hired consultant"; establish that he is their man, not someone else's. These are critical steps for building mutual trust and confidence and for increasing the effectiveness of knowledge transfer.

D. Use Local Skills Effectively

This has been a highly cost-effective way to achieve some of the project goals. When local expertise exists, donors should tap into it. This is particularly relevant to the current situation in Indonesia where some tension exists between local experts and foreign advisors, whose technical expertise is sometimes not highly valued by counterparts but is tolerated because it is usually a precondition for access to donor funds. Having worked here in the 1980s (both in the policy and statistics areas), I believe that counterparts in those days truly appreciated the expertise of foreign advisors because a wide gap existed then in the level of technical expertise between the two sides. However, after more than 15 years of having Indonesian civil servants acquire graduate degrees in western universities, this gap has narrowed significantly. Yet donors continue to require hiring of highly expensive foreigner advisors, sometimes with a narrow skill differential, while insisting on low locally-based payments (or none at all in the case of civil servants). This creates a situation of initial tension, mistrust and cynicism which has to be overcome by the foreign advisor before he can make any progress. This may be an issue that both donors and the Indonesian government prefer not to address, but I think that it is critical and needs to be addressed.

Both sides, the counterparts and donors, have valid reasons for their positions. Donors complain that expatriate advisors are needed on three grounds: first that certain tasks require objective observers which can best be performed by people who have no vested interest in the system with which they are involved; secondly, despite the technical skills of some of the Indonesian graduates, their language skills, which are necessary given the donors highly demanding reporting requirements, are usually not up to the levels needed for these tasks; and thirdly, that experience has shown that good Indonesian experts have such a high demand on their time that they tend to take on too many tasks and end up not producing outputs with the necessary quality. On the Indonesian side, it is difficult to argue with the proposition that having an expatriate advisor being paid 10 or more times that of a local for technical work that can be done competently by the local is not a healthy situation. If paid appropriately, locals believe that they would also produce the necessary quality. So we have an unfortunate situation here: donors claim, rightly, that past quality had not been good so they need expatriate advisors to ensure quality; and locals say that quality was not good because pay had not been adequate. Somehow, it is important for both sides to take measures to break this vicious circle.

I think that this project did something that may help break this circle. By hiring competent local experts, providing them with adequate compensation and managing them effectively, the project was successful in producing quality products with a fraction of the costs initially planned for expatriate advisors. In addition to the cost saving, use of local consultants enhanced the effectiveness of knowledge transfer, increasing the chances of sustainability of project outputs. How did the project do it? It took advantage of the retirement of some BPS officials and channeled their skills in areas where they could be most effective. They performed competently and effectively. The key to that success was good management. This provides a good lesson which hopefully can be heeded in the future.

E. Provide Necessary Tools Early On

If donors contemplate providing tools to improve technical skills (e.g. in the form of hardware and/or software), they should do it as early in the project life as possible. That would increase the odds of success of the project as adequate infrastructure is often a serious obstacle to achieving project goals. Because the project introduced most of its tools in its first year, it had more than two years to ensure that proper and effective use was made of the equipment. Had the project waited until the last year, for example, less would probably have been accomplished with the far shorter remaining time frame.

IV. WHAT NEXT?

If one cares about making informed policy decisions (both for the short term and the long term), there is no substitute for having reliable data. Without adequate and relevant data tools, policy formulation will amount to no more than guesswork. To ensure that relevant and good data for policy are produced, BPS is indispensable as a partner. It is the only institution that has the capability, skills and experience to produce the most critical sources of data for the nation: population, macroeconomic aggregates, country-wide microeconomic measures, country-wide price indices, country-wide labor force and social measures among others. Other more limited indicators covering one particular subject (e.g. business expectations, consumer expectations) may, perhaps even should, also be produced by other institutions (both governmental and in the private sector), if only to provide some checks and balances on BPS activities. But the major country-wide measures stated above can only be regularly produced by an institution like BPS. So if USAID wants to ensure that reliable numbers are produced, it needs to remain “engaged” with BPS and to assist it in ensuring that it is doing a good job: e.g. producing relevant, accurate and timely data.

Producing a steady stream of good and useful data is a continuous process and is not headline grabbing news. The project has been successful in forging a quiet but true partnership with BPS which resulted in the introduction of sustainable systems and methodologies producing data highly sought by users (these are described in Section II.B above). These are not negligible successes, particularly under the circumstances in which the project was operating. But the highest success in my view will undoubtedly be felt over the next 10-15 years in ensuring that the infrastructure that was built today will be relied upon for future policy formulation and that the staff that we are developing today will be able to face future challenges.

I believe that the BPS head office at this point in time has acquired the requisite technical tools and capabilities to sustain current operations on its own. In other words, I believe that we have successfully accomplished our mission of establishing in the BPS head office sustainable systems in the areas that we covered. So **there is no strong need at this point for a major effort**

for technical assistance aimed at the BPS head office. Of course, some limited gap-filling needs may arise from time to time in a particular area, but those could reasonably be fulfilled with specific limited short-term efforts, not efforts requiring resident advisors.

The biggest challenge that BPS faces today and in the foreseeable future, for which I believe that assistance will be necessary, is in improving capacity of its regional offices, particularly those in the districts. Decentralization has placed increasing importance on district-level data, putting significant strain on BPS resources, both human and budgetary, the latter continuing their decline in real terms. To give a simple example, where 297 district offices existed in 1999, depending solely on the BPS head office for budget and operation, there exist 416 today with some obtaining budgets from local sources far exceeding what BPS provides them. Coordinating needs of hundreds of local governments, with some at times conflicting, while at the same time fulfilling needs of national authorities and imposing strict standardization rules nationwide to ensure consistent national figures is a monumental challenge for any organization.

Understandably then, by far the highest priority for BPS in the next decade lies in increasing the capacity of staff in its district offices. The need, both budgetary and technical, to support this activity dwarfs any need in any other area. Assisting BPS in this activity cannot follow the standard pattern of the past, which relied solely on bringing expatriate expertise. Rather, it will need to rely primarily on local expertise, including that of existing head office staff.

At this point in time, Indonesia has accumulated enough expertise in basic statistical techniques and operations to provide adequate training to district office staff. I believe that the skills are there. The real challenge is in finding ways for channeling these skills in the right direction for maximum effectiveness. If USAID were to support such activities, it would mean that both BPS and USAID would have to undergo a drastic transformation in the way things are done: USAID would have to find ways to adequately compensate civil service staff for good performance on these tasks[9]; and BPS would need to find effective task/performance-based ways (different from the existing standard position-based practice) to provide training and motivate its true performers, and to be held accountable for proper management of this operation. I can only advise caution in designing the proper format for this activity, if it were to be undertaken. A well designed activity can potentially provide invaluable benefits to the country's development, whereas a flawed design may simply result in a waste of valuable resources.

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[9] This statement has a purely technical basis. It may well have political as well as legal implications which may affect its feasibility. These aspects are not considered in this report.

APPENDIX A
PROJECT REPORTS

Table A.1 lists all 70 reports produced by the project and submitted to both USAID and BPS. The 19 which were aimed primarily at users outside BPS were listed in Table 1, placed on the BPS website and consolidated into one volume which was distributed to various categories of users: policy makers (Bappenas, Bank Indonesia, parliament, ministries of Finance, Industry and Trade, Manpower and Agriculture among others), universities and donors.

Table A.1
STAT Project Reports

#	Author	Title	Date
1	Vijay Verma	Using Population Census 2000 to Improve BPS Integrated Household Survey Designs	June 00
2	Vijay Verma	Area Sampling for Economic and Agricultural Censuses Based on Population Census 2000	June 00
3	Vijay Verma	Notes on Sample Design and Re-Design for SUSI	June 00
4	Vijay Verma	Surveying Agricultural Households	June 00
5	Hananto Sigit	Employment Data in Indonesia: A Review of Existing Sources	June 00
6	Frank deLeeuw	Preliminary Evaluation of National Accounts and Prompt Indicators	July 00
7	Robert Torene	Evaluation of Establishment Directory	Aug 00
8	Robert Torene	Evaluation of SUSI Sample Design and Results	Aug 00
9	Robert Torene	Preparing a CHROMY Sample for Kabupaten Estimates	Aug 00
10	Hananto Sigit	Earnings Data in Indonesia: A Review of Existing Sources	Aug 00
11	John Kuiper	Seasonal Adjustment of Indonesian Time Series	Aug 00
12	John Kuiper	Notes on Short-Term Labor Force Indicators	Aug 00
13	John Kuiper	Comparison of Implicit Price Indexes for Manufacturing	Aug 00
14	Yahya Jammal	Revision of Quarterly Production Accounts Statistical Paper # 1	Oct 20
15	Yahya Jammal/ Rosniaty Ismail	The Monthly Manufacturing Production Survey Statistical Paper # 2	Nov 00
16	Sugito Suwito	Enhancing the Role of Functional Staff and Improving Performance Evaluation	Nov 00
17	Hananto Sigit	Survei Triwulanan Pemulihan Kesempaten Kerja : A Proposed Survey to Monitor Short Term Employment & Earning Changes	Dec 00
18	Sri Budianti Sukmadi	Use of Population Census 2000 to Improve Household Survey Frame	Dec 00
19	Frank deLeeuw	National Accounts and Prompt Indicators: Progress and Future Priorities	Feb 01
20	Vijay Verma	SUSI Estimation Procedures	Feb 01
21	Vijay Verma	Lecture Notes: Sampling Over Time	Feb 01
22	Sugiarto	Progress Report : Monthly Manufacturing Survey	Feb 01
23	Vijay Verma	Agricultural Census and Surveys Statistical Paper # 5	Mar 01
24	Yahya Jammal	Quarterly National Accounts in Indonesia: Current Sources and Methods (Draft) Statistical Paper # 3	Feb 01
25	Vijay Verma	Selected Issues in Labor Force Statistics Statistical Paper # 4	Mar 01
26	John Kuiper	The Consumer Price Index: Selected Conceptual Issues	Mar 01
27	John Kuiper	Converting the Wholesale Price Index into a Producer Price Index	Mar 01
28	Sri Budianti Sukmadi	Area Sampling for Agriculture Census	Mar 01
29	Bruce A.Johnston	An Interactive Survey Questionnaire for the Badan Pusat Statistik of Indonesia	Mar 01
30	Yahya Jammal / Vijay Verma	Monthly Manufacturing Production and Employment Indices Statistical Paper # 6	Apr 01
31	Sugiarto	Progress Report on Industrial Production	May 01
32	Sri Budianti Sukmadi	Choice of Sampling Unit in the Agriculture Sample Census 2003	May 01
33	Suwandhi Sastrotaruno	Preparations for the 2003 agricultural Census	May 01
34	Yahya Jammal	Chain Linking National Accounts Statistical Paper # 7	June 01
35	Uzair Suhaimi / Yahya Jammal	Measuring Open Unemployment in SAKERNAS Statistical Paper # 8	June 01
36	Frank de Leeuw	Unit Value Indexes for Exports and Imports Statistical Paper # 9	July 01

37	Sri Budianti Sukmadi	Sample Selection Method for Agricultural Sample Census 2003	July 01
38	Sugiarto	Manufacturing Survey: Progress Report	July 01
39	Suwandhi Sastrotaruno	Preparations for the 2003 agricultural Census: Progress Report	Aug 01
40	Yahya Jammal / Rifa Rufiadi	Classifying Manufacturing Production by Commodity vs by Establishment: Evidence Using 1998 Annual Survey Data Statistical Paper # 10	Aug 01
41	Sugiarto	Pilot for the Quarterly Manufacturing Survey	Sep 01
42	Frank de Leeuw	Measuring Changes in Inventories in Indonesia Statistical Paper # 11	Sep 01
43	Sri Budianti Sukmadi	Sample Design for the Second Pilot Planned under the Agriculture Census 2003	Nov 01
44	Suwandhi Sastrotaruno	Preparations for the 2003 Agriculture Census: Progress Report	Nov 01
45	Hananto Sigit	Evaluation of the First Round of the Informal Sector Pilot Survey	Feb 02
46	John Kuiper	Seasonal Adjustment for Lebaran	Feb 02
47	Frank de Leeuw	An Expanded Industrial Production Index for Indonesia Statistical Paper # 12	Feb 02
48	Suwandhi Sastrotaruno/ Choiril Maksum	Aggregate Rice Data in Indonesia: A Brief Overview Statistical Paper # 13	Feb 02
49	Sugiarto	Planned Pilots for Manufacturing Surveys	Feb 02
50	Sri Budianti Sukmadi	Geographical Integration of Household Surveys	Mar 02
51	Kusmadi Saleh	Indonesian Income Account: Progress Report	Apr 02
52	Sri Budianti Sukmadi	Using Rolling Samples in Selected BPS Surveys	May 02
53	Suwandhi Sastrotaruno	Preparations for Agriculture Census 2003: Progress Report 3	June 02
54	Kusmadi Saleh	Indonesian Income Account: Progress Report 2	June 02
55	Frank de Leeuw	Changes in Inventories Held By Manufacturers, 1998-99: Analysis of Annual Survey Data	July 02
56	Sugiarto	Progress on Pilots for Manufacturing Surveys	July 02
57	John Kuiper	Operational Manual for Benchmarking Using the BENCH Program	July 02
58	Sri Budianti Sukmadi	Linking Design and Organization in the Agriculture Census Sample	Aug 02
59	Sugiarto	Evaluation of Manufacturing Survey Pilots	Sept 02
60	Kusmadi Saleh / Yahya Jammal	Toward Income Accounts for Indonesia Statistical Paper # 14	Sept 02
61	Suwandhi Sastrotaruno	Preparations for Agriculture Census 2003: Progress Report 4	Sept 02
62	Vijay Verma	Notes on Estimation Procedures	Oct 02
63	Vijay Verma	Implementation of SUSI Estimation Procedures	Oct 02
64	Yahya Jammal / Arizal Ahnaf	Is Susenas Rice Consumption in Urban Areas of Indonesia Understated? Statistical Paper # 15	Nov 02
65	Hananto Sigit	Evaluation of the Informal Sector Pilot Survey	Nov 02
66	Suwandhi Sastrotaruno	Preparations for Agriculture Census 2003: Progress Report 5	Dec 02
67	Sugiarto / Suryamin	Capacity Utilization in Indonesian Manufacturing	Feb 03
68	Yahya Jammal/ Uzair Suhaimi	Quarterly Wage Survey of Livestock and Fishery	Apr 03
69	Yahya Jammal/ Wendy Hartanto	Benchmarking Susenas health and Education Data	May 03
70	Yahya Jammal	STAT Project Summary Report	June 03

APPENDIX B

FORTHCOMING PUBLICATION ON PROJECT PAPERS

This note will appear in a forthcoming issue of the *Bulletin of Indonesian Economic Studies* under the title: “Recent Technical Papers on BPS Data.”

The Indonesian national statistics agency (BPS) is unique among developing countries in nurturing statistical skills at an early age through its statistical academy, with its highly selective admissions policy for high school students. Since the 1960s, it has established a solid reputation for the high calibre of its technical and operational capabilities. By the 1980s few developing countries, if any, could match BPS’s record in terms of the number of regular censuses (population, economic, agriculture, industry), large-scale surveys and complex statistical products such as input–output tables and social accounting matrices. And this for one of the world’s most populous and diverse countries. Unfortunately, BPS has fallen victim to significant budget tightening since the 1997-98 economic crisis. Its average annual growth in nominal expenditures on regular activities between 1997 and 2002 was about one-third that of the 1993–97 period, pulling corresponding real expenditures in 2002 back to levels similar to those of 1993. Such cuts cannot but adversely affect product quality.

At the same time, the great advances in computer technology and the increasing sophistication of users by the 1990s has increased the quality and competence of user analysis. By 2000, private and public criticisms were being voiced against some BPS data that were perceived to be insufficiently reliable (the consumer price index, the national accounts, the poverty measures, for instance). BPS’s inability or reluctance to address these issues adequately encouraged accusations of political motivation behind certain data, resulting in some changes in BPS leadership in the middle of 2000.

This was the environment in which the USAID-funded STAT (Statistical Assistance to the Government of Indonesia) Project began. The project aimed at assisting BPS to design new activities based upon improved statistical techniques, in order better to meet user demand for more accurate and timely data. A major thrust was to help BPS project an image of openness of operations and transparency of computations, by documenting sources and methods and soliciting user feedback through various channels.

In joint partnership with BPS, the project has produced several statistical papers aimed primarily at users outside BPS.[10] Some simply document in detail the methodology of statistical series of interest. Others explore data-related issues to stimulate discussion on them.[11]
This note provides a brief description of the topics covered, since I believe they will be of interest to many BIES readers. The topics are divided into four major areas: national accounts, industry, labour force and agriculture.

National Accounts
‘Revision of Quarterly Production Accounts’, by Yahya Jammal, October 2000. This paper reviews the impact of revisions of quarterly production accounts, to examine the claim that such figures were being ‘cooked’ because quarterly revisions tended to be minor. One finding was that revisions had not been insignificant. Another finding was that quarterly revisions in some sectors suggest a systematic under- or over-estimation in the preliminary figures. The paper then proposes a number of steps that can be taken by BPS to raise confidence in published figures, by increasing

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[10] Other reports of the project, produced for internal and/or limited use only, are not reviewed here

[11] These papers are available on the BPS website at: www.bps.go.id/papers/Papers_and_Analysis/ Papers_by_BPS_and_USAID_Project.

the transparency of its revision policy and improving the estimation methodology used.

Quarterly National Accounts in Indonesia, Current Sources and Methods (Draft), by Yahya Jammal, February 2001. This paper represents the first attempt, known to the author at least, to document the sources and methods used by BPS to compute Indonesia's national accounts. Its preparation followed years of complaints by outside users that these computations lacked transparency. Documentation was believed to be the most effective way of communicating to users how figures had been computed over time and the myriad sources and steps that need to be followed to ensure regular and timely production of these figures. The published nine-sector production accounts were based on estimations of 58 subsectors which, in turn, were the outcome of estimations involving about 200 commodities and commodity groups. The expenditure account takes the GDP computed from the production account as the benchmark and then attempts to reconcile estimations of its six major components with that benchmark.

'Chain Linking National Accounts', by Yahya Jammal, June 2001. This paper was prompted by an apparent decision by BPS to adopt the chaining methodology recommended by the 1993 System of National Accounts. It discusses the serious conceptual and practical issues involved in chain linking national accounts, urges caution in considering its adoption, and finally discusses which methodology to adopt, which indexing procedure to use, what data to publish, in what format and at what level of detail.

'Unit Value Indexes for Exports and Imports', by Frank de Leeuw, July 2001. This paper was prompted by the discovery of substantial weaknesses in the foreign trade deflators that had been used by BPS. A new methodology for computing unit value indices for deflating exports and imports of goods is documented. The methodology is designed to resolve two problems that can be severe when using unit values: heterogeneity and inaccuracy. It follows four steps: (1) collecting customs reports on value and weight for thousands of individual products; (2) measuring the ratio of the unit value in the current month to that in the previous month wherever data are available; (3) counting the number of unit value ratio observations in each industry (specifically, 2-digit industries of the harmonised system) and discarding of industries with very few observations; and (4) construction of price change series for included industries, using the median unit value change of the products in each industry. Results were plausible and the methodology and results for 2000–01 have been documented in BPS (2002). More recent figures have been made available to a limited number of users, and preparations are currently being made for regular monthly publication for use by the wider public.

'Measuring Changes in Inventories in Indonesia', by Frank de Leeuw, September 2001. This paper recommends direct estimation of inventory changes in the national accounts, instead of their derivation as a residual between total production and final sales, as has been the case to date. One advantage of this approach is that the inventory change estimates themselves would improve. When they are residuals, they reflect not only actual inventory change, but also errors in measuring production and final sales. Improved estimates based on direct measurement should allow a better understanding of the magnitude and the timing of inventory change in economic fluctuations. Perhaps even more important is the potential advantage of improving estimates of private consumption, the largest component of final expenditures. A methodology is then proposed for deriving estimates, including (1) data on inventories in physical units (kilograms, barrels) for selected commodities; (2) data on the value of inventories on the balance sheets of enterprises. BPS is currently computing these figures for possible future publication.

'Toward Income Accounts for Indonesia', by Kusmadi Saleh and Yahya Jammal, September 2002. This report documents an attempt to develop income accounts for Indonesia for 1990–2000, which, it is hoped, can be updated regularly by BPS in the future. The findings included the following. First, the combined contribution of consumption of fixed capital and net indirect taxes has remained more or less the same over time, at about 13–15%. Second, the share of employee compensation has also remained more or less the same over the period (around 32–35%). The

only exception was 1998, which showed a decline of over eight percentage points that was quickly restored to the historical norm in the following years. Third, the behaviour of property income was different: its share was roughly the same as that of employee compensation in 1990; it declined slightly through 1995, then rose sharply in 1996 and 1997, only to decline gradually again to the same level as the share of employee compensation in 2000.

Industry
'The Monthly Manufacturing Production Survey', by Yahya Jammal and Rosniaty Ismail, November 2000. This paper documents the new quarterly manufacturing production system designed by BPS in compliance with the IMF's Special Data Dissemination Standards. The system contains a monthly subsystem designed to provide a prompt indicator (i.e. available with a 6-week lag) at the 1-digit ISIC (International Standard Industrial Classification) level, and a slower quarterly indicator at the 3- and 2-digit ISIC level. The system has been operational since 2000, and its results are regularly published by BPS on its website and in *Indikator Ekonomi*. The report argues that such a system, which emphasises timeliness, could be used as a model for future BPS small sample establishment surveys; these could be run directly from the BPS head office, rather than having to rely on the present slower and less flexible process involving multi-level regional offices. The success of the monthly survey operation has prompted BPS to consider turning the remaining quarterly subsystem into a monthly survey as well, to provide users with more disaggregated data more frequently and more promptly.

'Monthly Manufacturing Production and Employment Indices', by Yahya Jammal and Vijay Verma, April 2001. This paper introduces two major additions to the existing monthly/quarterly manufacturing production survey. First, it evaluates employment data in that survey and finds them highly plausible. Since then, BPS has been regularly producing both monthly production and monthly employment indices (although only the production indices are regularly published), and has documented the historical 1993–2000 series in a separate publication (BPS 2001a).
A second addition was the introduction of benchmarking methodology to ensure consistency between the monthly/quarterly manufacturing production surveys and the more complete annual survey. As a survey of a fixed panel of establishments, the monthly/quarterly system misses the contribution of new establishments created since the sample was selected. In a highly dynamic sector such as manufacturing, this can result in substantial understatement of the true growth of the population of establishments. The benchmarked 1993–2000 monthly historical series was published separately in BPS (2001b).

'Classifying Manufacturing Production by Commodity vs by Establishment: Evidence Using 1998 Annual Survey Data', by Yahya Jammal and Rifa Rufiadi, August 2001. This paper reports on a major change introduced by BPS to its annual manufacturing surveys since 1998: coding of individual commodities used and produced by establishments. This provides users with an invaluable set of tools to analyse both establishment-level and sectoral production and cost structures. Users interested in analysing structural changes in manufacturing, for example, can now obtain on an annual basis subsets of non-oil manufacturing 'make' tables and intermediate input–output tables. In the past, users had to wait for the full input–output table to be produced by BPS once every five years.

'An Expanded Industrial Production Index for Indonesia', by Frank de Leeuw, February 2002. This paper documents a methodology that allows computation of a production index covering the whole industrial sector, and not only non-oil manufacturing in medium and large establishments, as has been the case in the past. By integrating the results of the manufacturing production survey with monthly data on oil, gas, other minerals and electricity, the new index would provide a more complete indicator of non-farm goods activity than does the presently published index. BPS is currently computing this index, although the results have not yet been published.

Labour Force
'Employment Data in Indonesia: A Review of Existing Sources', by Hananto Sigit, July 2000. This paper reviews and documents existing sources of employment data. Six groups of sources are reviewed (household surveys, establishment surveys, agriculture census, community data surveys, *ad hoc* surveys and administrative records), and their strengths and weaknesses briefly evaluated.

'Earnings Data in Indonesia: A Review of Existing Sources', by Hananto Sigit, August 2000. This paper reviews and documents existing sources of earnings data. After defining the meaning of 'earnings' in the Indonesian context, the author reviews three groups of sources (household surveys, establishment surveys and the agricultural census), giving a brief evaluation of their strengths and weaknesses.

'Selected Issues in Labor Force Statistics', by Vijay Verma, March 2001. This paper evaluates the current methodology used by BPS for measuring employment and unemployment, in response to doubts cast on whether computations conformed with international standards. While the measurement of employment was found to conform with the standard international definition (recommended by the ILO), the measurement of unemployment was not. The report further suggests that some empirical investigation be conducted to measure the implications of adopting a relaxed ILO definition of 'unemployed' which takes into consideration the impact of 'discouraged workers'. The report further outlines the main elements of a quarterly labour force survey, currently being implemented by BPS for 2002, which allows production of quarterly national estimates and consistent annual provincial estimates.

'Measuring Open Unemployment in Sakernas', by Uzair Suhaimi and Yahya Jammal, June 2001. This paper attempts to measure empirically the impact of applying the 'relaxed' definition of 'unemployed' to Sakernas (National Labor Force Survey) data from 1996 through 2000. Results showed that 'discouraged workers' represented a significant phenomenon in Indonesia, particularly after the 1997/98 crisis. Using the relaxed definition would raise the unemployment rate in 1999 and 2000, for example, from 6.4% and 6.1% respectively to 8.8% and 8.2%. Treating these workers as part of the unemployed in the civilian labor force makes a substantial difference not only nationally, but by gender, urban/rural location and province as well.

Agriculture
'Agriculture Census and Surveys', by Vijay Verma, March 2001. This paper evaluates the current methodology used by BPS for estimating rice production, namely by relying on the crop-cutting approach which includes two components: an eye estimate of area harvested (collected by Department of Agriculture extension agents) and estimates of yield per hectare (collected by BPS and Department of Agriculture extension agents). The paper suggests that the methodology has substantial shortcomings. A supplemental methodology, relying on regular household surveys, is then proposed.

'Aggregate Rice Data in Indonesia: A Brief Overview', by Suwandhi Sastrotaruno and Choiril Maksum, February 2002. This paper documents how aggregate rice consumption and production in Indonesia have been computed in past decades. A discussion of various elements of the methodology suggests that the estimates for both production and consumption are subject to some margin of error; the error in the consumption estimate is likely to be small and that in the production estimate much larger. Although total rice consumption in Indonesia may be understated, that of total rice production is almost certainly overstated, and by a significant margin. The report's very rough calculation suggests that there is a net overstatement of production of about 17%.

'Is Susenas Rice Consumption in Urban Areas of Indonesia Understated?', by Yahya Jammal and Arizal Ahnaf, November 2002. This paper examines the widely held view that rice consumption figures based on the Susenas (National Socio-Economic Survey) are understated. It compares per

capita rice consumption from Susenas data in urban areas in 1996 with that from a more complete, elaborate and therefore reliable source (the cost of living survey, Survei Biaya Hidup). The conclusion is that per capita rice consumption estimates derived from Susenas are not understated.

Concluding Remarks

Useful statistics are the product of the interaction between users and producers. It is this interaction that ensures that the right statistics are produced with the best practically achievable level of accuracy. Without it, producers will not be able to determine which data to publish, in what format, with what frequency and with what delays. This note is intended to promote such interaction by informing BIES readers, representing an important class of users, about some of the latest technical developments at BPS in four areas. The hope is that BPS will continue this process of informing users in these areas, as well as in other areas of interest.

In return, users have a responsibility to provide feedback to BPS about their statistical interests. By asking probing questions or simply expressing their views on particular data, users can help BPS evaluate the net benefits of producing particular data series. Lack of user feedback may not necessarily reflect lack of interest, but it has the same negative effect nevertheless.

As stakeholders in the process of data development in Indonesia, BIES readers can play a major role in helping BPS face the decade's new challenging realities: tighter budgets; increasing demands for timely data; greater flexibility in data design and management; and, perhaps its biggest challenge of all, how to cope with the new uncertain environment of decentralisation, with emboldened local governments imposing their own differing data priorities.

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