U.S. Energy Information Administration

Short-Term Energy Outlook Model Documentation:
Macro Bridge Procedure to Update Regional Macroeconomic Forecasts with National Macroeconomic Forecasts

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1. Overview

The Regional Short-Term Energy Model (RSTEM) uses macroeconomic variables such as income, employment, industrial production and consumer prices at both the national and regional[1] levels as explanatory variables in the generation of the *Short-Term Energy Outlook* (STEO). This documentation explains how national macroeconomic forecasts are used to update regional macroeconomic forecasts through the RSTEM Macro Bridge procedure.

Both the national and regional macroeconomic forecasts are generated by models developed by IHS Global Insight Inc. (GI). GI updates its national macroeconomic forecasts monthly using its model of the U.S. economy. EIA re-runs the GI model to produce national-level macroeconomic forecasts that are consistent with the STEO energy price forecasts.

GI also produces forecasts by state and by region on a quarterly basis through its U.S. Regional Service. At the time when the regional model is run, the regional forecasts are consistent with the GI baseline national forecasts. However, since the national forecasts are revised with the STEO price paths, and are also updated monthly, there may be a disconnect between the regional and national macroeconomic forecasts.

The Macro Bridge (MB) procedure is run every month to adjust the regional forecasts so that they reflect economic activity that is consistent with the current national forecasts.

2. Methodology

A few decisions were made upfront to ensure that consistency between the regional and national macroeconomic information is maintained in a meaningful way while minimizing the processing effort. First, the MB procedure is performed on quarterly data series, even though eventually all macroeconomic variables are converted into monthly data series for use in RSTEM.[2] Second, the MB focuses on aligning growth rates rather than levels. Third, the same adjustment factor is applied to all regional data series that correspond to a given national variable.

[1] The regions are the nine Census Divisions: New England, Middle Atlantic, South Atlantic, East North Central, East South Central, West North Central, West South Central, Mountain and Pacific. In addition, RSTEM also produces forecasts for four major states: California, Florida, New York and Texas.

[2] The national and regional macroeconomic datasets are maintained as quarterly series because variables in the National Income and Product Accounts, such as gross domestic product (GDP), are quarterly series. Some national variables are available monthly, but they are converted into quarterly series in the Global Insight models. Some regional variables are annual data series and quarterly series are generated by Global Insight.

There are five steps in the MB procedure. The first step is to compile a national-level aggregate data series for each regional macroeconomic data series for a given macroeconomic variable. For example, a national GDP value is calculated from the regional GDP values. For most variables this would just be the sum of the nine Census Division-level values. However, the aggregate of the regional series may not equal the national series. There may be definitional differences between some national and regional variables; and the historical adjustments to some national data may not yet have been incorporated into the regional data. For real variables, the national aggregates are generally computed by the Fisher formula. They are not exactly equal to the sum of the regional data. For example, by definition, the sum of regional gross state products (GSP) is not exactly the same as national gross domestic product (GDP), even in nominal terms. But the two series are very similar and the aggregate real GSP is expected to change in the same way as real GDP.[3]

Some regional variables are defined as indexes and rates (e.g. consumer price index and unemployment rate). To minimize computation effort, a simple weighted average is used to represent the national-level "aggregate". For example, the regional shares of real personal income are used as weights for the computation of the aggregate consumer price index. These aggregates would not have the same values as the national variables as the latter are compiled either by the Fisher formula or by dividing one national data series by another.

Mathematically, we have,

Simple Summation: $X_{Agg} = \sum X_i$ (1)

Weighted Average: $X_{Agg} = \sum (X_i * W_i / W_{Agg})$ (2)

where

X_{Agg} = National "aggregate" computed for the regional variable X

X_i = Regional series of X for region i

W_i = Regional variable used as weight for region i

W_{Agg} = Aggregate of regional weight variable = $\sum W_i$

Table 1 lists the regional macroeconomic variables used in RSTEM, and the method used to compile the aggregate concepts.

[3] The national total of GSP is not the same as GDP for two reasons: GSP excludes and GDP includes the compensation of federal civilian and military personnel stationed abroad and government consumption of fixed capital for military structures located abroad and for military equipment, except office equipment; and GSP and GDP have different revision schedules.

Table 1. Regional Macroeconomic Variables and Aggregate Concepts

Regional Variable Name	Description	Regional Aggregate Variable Name	Aggregation Method	Weights
CGSP	Real Gross State Product	CGSP_US	Sum	
CGSPMFG	Real Gross State Product, Manufacturing	CGSPMFG_US	Sum	
GSPMFG	Nominal Gross State Product, Manufacturing	GSPMFG_US	Sum	
CWD	Real Wage Disbursements	CWD_US	Sum	
CWDMFG	Real Wage Disbursements, Manufacturing	CWDMFG_US	Sum	
CWDCRM	Real Wage Disbursements, Mining and Construction	CWDCRM_US	Sum	
CWDSPP	Real Wage Disbursements, Private Services	CWDSPP_US	Sum	
PYR	Real personal Income	PYR_US	Sum	
PY	Nominal Personal Income	PY_US	Sum	
CPI2000	Consumer Price Index, 2000=1.0	CPI2000_US	Weighted Average	Regional PYR shares
DEFLGSPMFG	Implicit Price Deflator for GSP, 2000=1.0	DEFLGSPMFG_US	= GSPMFG_US / CGSPMFG_US	
IPMFG	Industrial production Index, Manufacturing, 1997=1.0	IPMFG_US	Weighted Average	Regional CGSPMFG shares
EE	Employment, Nonfarm	EE_US	Sum	
EEMFG	Employment, Manufacturing	EEMFG_US	Sum	
EECRM	Employment, Mining and Construction	EECRM_US	Sum	
EESPP	Employment, Private Service Providing	EESPP_US	Sum	
POP	Population	POP_US	Sum	
QHALLC	Number of Households	QHALLC_US	Sum	
XRUNR	Unemployment Rate	XRUNR_US	Weighted Average	Regional EE shares

The second step is to identify a counterpart, or reference variable, from the national model for each regional aggregate. For regional variables that have no corresponding national counterparts, a proxy national variable is computed from available national variables. These assignments are made in such a way that aligning growth rates, for benchmarking purposes, will make sense. For example, the sum of regional real wage disbursements is assumed to behave similarly to the national wage disbursements, deflated by the implicit price deflator for personal income.

Table 2 shows the mapping between the regional aggregates and the reference variables in the national model.

Table 2. Mapping Between Regional Aggregate Variable and National Variable

Regional Aggregate Variable		National Variable	
Name	**Description**	**Name**	**Description**
CGSP_US	Real Gross State Product	GDPQXUS	Real Gross Domestic Product
CGSPMFG_US	Real Gross State Product, Manufacturing	ZOMNIUS	Industrial Production Index, 2002=1.0
CWD_US	Real Wage Disbursements	PYWSDR = PYWSD / (PY / PYR)	Real Wage Disbursements = Nominal Wage Disbursements / Price Deflator for Personal Income
CWDMFG_US	Real Wage Disbursements, Manufacturing	PYWSDR * EMPMPUS / EMNFPUS	Real Wage Disbursements * Manufacturing Share of Nonfarm Income
CWDCRM_US	Real Wage Disbursements, Mining and Construction	PYWSDR * (EMPIPUS + EMPCPUS / EMNFPUS	Real Wage Disbursements * Mining and Construction Share of Nonfarm Income
CWDSPP_US	Real Wage Disbursements, Private Services	PYWSDR * EMCMPUS / EMNFPUS	Real Wage Disbursements * Private Services Share of Nonfarm Income
PYR_US	Real personal Income	PYR	Real personal Income
PY_US	Nominal Personal Income	PY	Nominal Personal Income
CPI2000_US	Consumer Price Index, 2000=1.0	CICPIUS	Consumer Price Index, 1982-1984=1.0
DEFLGSPMFG_US	Implicit Price Deflator for GSP, 2000=1.0	WPIINUS	Producer Price Index, Industrial Commodities Excluding Energy
IPMFG_US	Industrial production Index, Manufacturing, 1997=1.0	ZOMNIUS	Industrial Production Index, 2002=1.0
EE_US	Employment, Nonfarm	EMNFPUS	Employment, Nonfarm
EEMFG_US	Employment, Manufacturing	EMPMPUS	Employment, Manufacturing
EECRM_US	Employment, Mining and Construction	EMPIPUS + EMPCPUS	Employment, Mining and Construction
EESPP_US	Employment, Private Service Providing	EMCMPUS	Employment, Commercial
POP_US	Population	POP	Total Population, including Armed Forces Overseas
QHALLC_US	Number of Households	HHOLDS	Number of Households
XRUNR_US	Unemployment Rate	XRUNR	Civilian Unemployment Rate

The third step is to calculate the adjusted regional aggregate. A set of adjusted regional aggregates are created with their history equal to values in the regional aggregate series. To compute the forecast values of the adjusted aggregate variable, the quarterly changes of the corresponding references series from the national model is applied to the previous quarter of the adjusted regional aggregate variable.[4]

For historical period: $X\_ADJ_{Agg} = X_{Agg}$ (3)
For forecast period: $X\_ADJ_{Agg} = X\_ADJ_{Agg}(-1) * X_{Nat} / X_{Nat}(-1)$ (4)

where
X_ADJ_{Agg} = Adjusted regional "aggregate" series
X_{Nat} = National reference series from the national model
(-1) = One quarter time lag

The fourth step is to adjust the regional series. Assuming that the relationship between each region and the regional aggregate remains the same, the adjusted regional series is computed by multiplying the original regional share (the ratio between the regional series and the regional aggregate) by the adjusted regional aggregate series.

$X\_ADJ_i = (X_i / X_{Agg}) * X\_ADJ_{Agg}$ (5)

where
X_ADJ_i = Adjusted regional series for region i

Consider a simple example with period 1 being the last historical period. The original regional aggregate has a value of 100 in period 1 and 102 in period 2 (2% increase for the quarter), and the updated national reference series has the corresponding values of 110 and 114 (+3.6%). The adjusted value for the regional aggregate for period 2 is 103.6 (=100*114/110), or 3.6% increase. If region A has an original value of 10 in period 1 and 10.1 in period 2 (+1%, which is slower than the aggregate growth rate), then the adjusted value for region A in period 2 is 10.26 (= 10.1/102*103.6), or 2.6% increase.

3. Examples of Adjustments

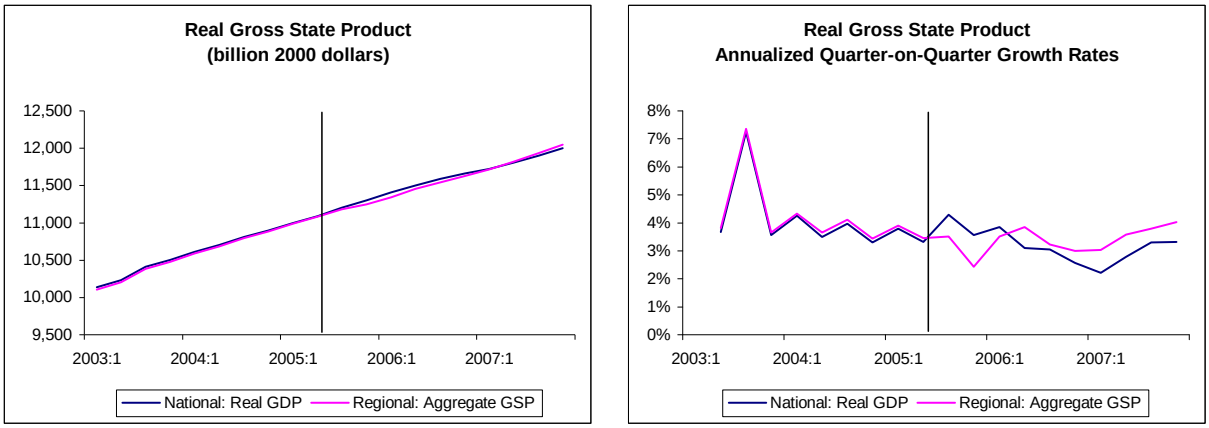
Two macroeconomic variables are chosen to illustrate the adjustments made to the regional series using the MB procedure. The first is real gross state product, which can be aggregated to the national level by simple sum and is closely related to the national gross domestic product. The second is real wage disbursements for the manufacturing

[4] Alternatively, the forecast values of the regional aggregate variable can be adjusted by the deviation of the current national reference series from the GI baseline national reference series that was consistent with the baseline regional forecasts. This would require more maintenance effort in general, and particularly when the national series have undergone revisions (e.g. rebasing, historical data adjustments) since the baseline version was published.

sector, for which no national reference series is available and a proxy has to be created. The regional series were extracted from the GI Regional Model released in October 2005, and the national series were the ones adopted for the January 2006 STEO, based on the December verion of GI model of the U.S. economy.

Figure 1 compares the levels and the growth rates of aggregate real GSP and real GDP. The differences between the two series are less than 0.6 percent, and the quarterly growth rates in the historical period are also very similar. In the forecast period national real GDP has slightly stronger growth rates for the near term and slightly lower growth rates afterwards.

Figure 1. Aggregate Real Gross State Product and Corresponding National Reference Series



The adjustment factor series, computed from the quotient of the adjusted aggregate GSP series and the original GSP series, varies between 0.995 and 1.005 (see Figure 2). When this adjustment factor series is applied to the regional GSP, the revisions are relatively small. Figure 3 compares the levels of real GSP for the nine regions before and after the adjustment procedure.

Figure 2. Adjustment Factor for Aggregate Real Gross State Product

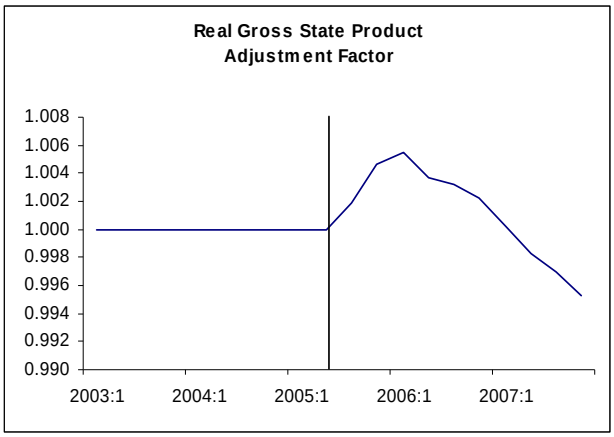
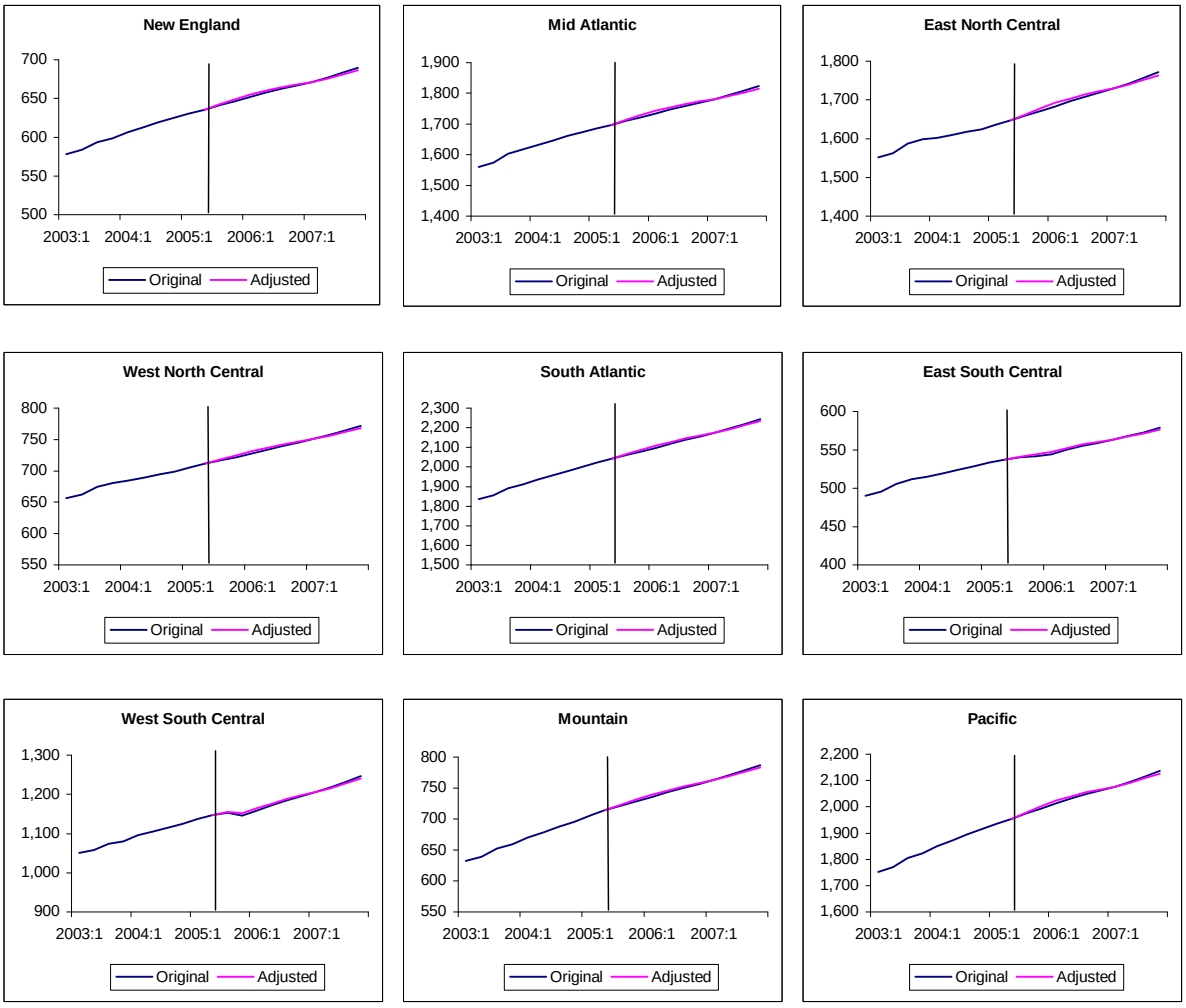


Figure 3. Real Gross State Product by Region before and after Adjustments (billion 2000 Dollars)



Another variable used in the regional model is real wage disbursements for the manufacturing sector. This variable does not exist in the national model. Based on the set of national macroeconomic variables available to RSTEM, a proxy variable was compiled by deflating the nominal wage disbursements with the implicit deflator for personal income, then multiplying it by the manufacturing employment share. There are two factors involved in the approximations. First, the price deflator for wage disbursements may not be the same as the price deflator for personal income, which includes benefits such as medical insurance. Second, average wages and salary in the manufacturing sector is not the same as that of all non-farm businesses, so applying the manufacturing employment share to total income is at best a fair approximation. Nevertheless, the differences in level may not be a problem so long as the growth rates of the two series are historically compatible.

Figure 4 compares the levels and the growth rates of aggregate real wage disbursements for manufacturing and the national proxy. The level of the regional aggregate is about 20 percent higher than the national proxy. The quarterly historical growth rates of the two series do not correspond very well. However, the growth rates in the forecast period are much less erratic, and the discrepancies between the two are similar to those for GSP and GDP in Figure 1. So this national proxy was adopted for the regional concept. Continuous effort will be made to improve the compilation of national proxies as well as the MB procedure.

Figure 4. Aggregate Real Wage Disbursements, Manufacturing, and Corresponding National Reference Series

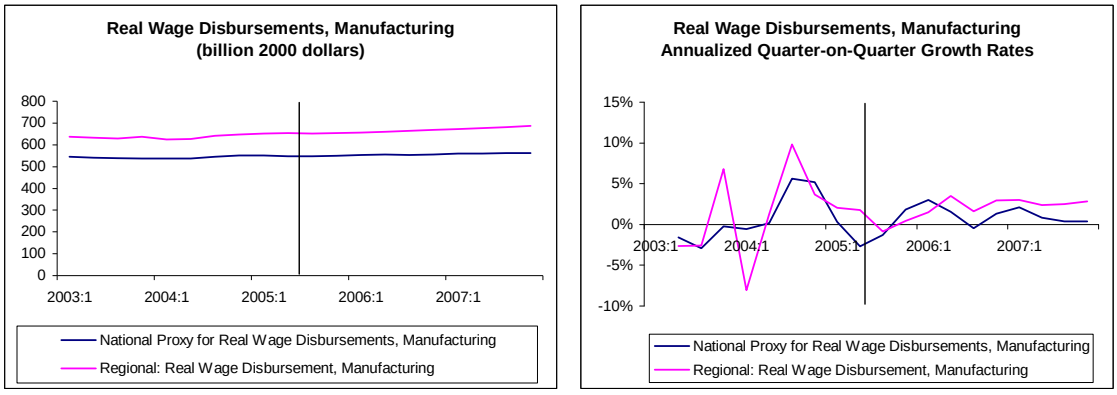


Figure 5 shows the computed adjustment factor, which varies between 0.975 and 1.006. Figure 6 compares the levels of real wage disbursements for manufacturing for the nine regions before and after the adjustment procedure.

Figure 5. Adjustment Factor for Aggregate Real Wage Disbursements, Manufacturing

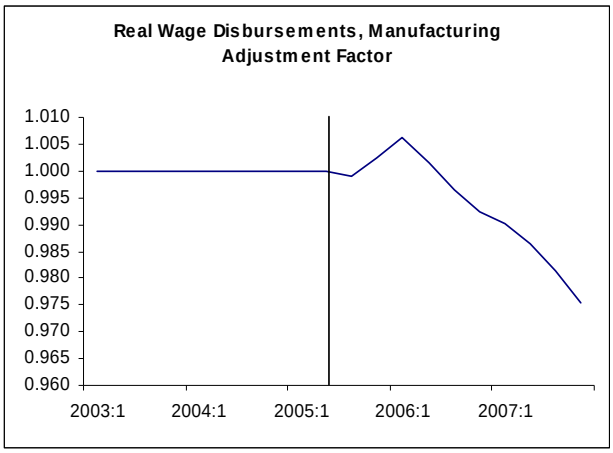
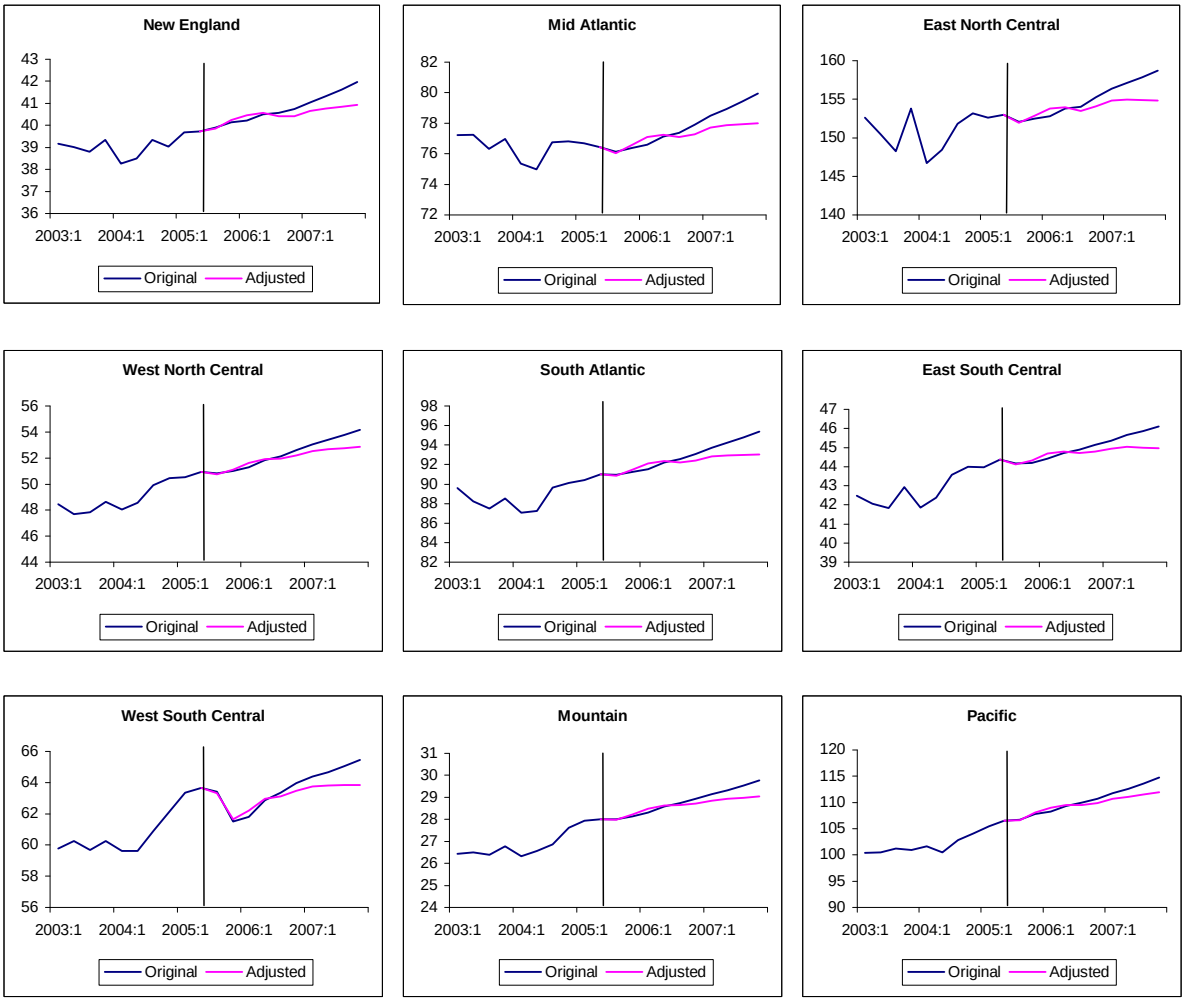


Figure 6. Real Wage Disbursements, Manufacturing, by Region before and after Adjustments (billion 2000 Dollars)



4. Frequency Conversion

The quarterly national and regional macroeconomic series have to be converted to monthly series for use in the Energy Forecasting Model. Among all macroeconomic variables, number of households and housing stocks are the only variables with observations defined as end-of-period values. They are converted into monthly series by the "cubic-match last" method – the quarterly values are assigned to the last month of the quarter, and the values of the interim periods are interpolated using cubic spline. All other macroeconomic variables are converted by the "quadratic-match average" method – the monthly series are filled using a quadratic equation with the average of the 3 months matching the quarterly series.

Conversely, when the monthly series have to be converted back to quarterly series, the "last observation" method is used for number of households and housing stocks, and the "average" method is used for all other variables.

5. Conclusion

The Macro Bridge procedure described in this paper updates the regional macroeconomic forecasts based on the latest national macroeconomic forecasts, both of which serve as inputs into the Regional Short-Term Energy Model. As an integral part of the model, the MB procedure is performed in an EVIEWS program called MacroDataPrep.prg. The codes are presented in the appendix.

Appendix. EVIEWS Codes for Macro Bridge Procedure

```
'-------------------------------------------------------------------------------------------------------------
' ---  MACRODATAPREP.PRG
' ---       1. Read and rename latest set of national macro data
' ---       2. Read regional macro data (available quarterly)
' ---       3. Create additional regional macro variables
' ---       4. Perform macro bridge procedure at the quarterly level:
' ---                 - Compute regional aggregate variables
' ---                 - Identify the corresponding national variable or proxy variable
' ---                 - Create adjusted regional aggregate variables using national growth rates in the
forecast period
' ---                 - Revise the regional series using the differentials between the adjusted and
initial regional aggregates
' ---       5. Store macro data in databank and fetch them into stifs_tmp.wf1
'
' ---       Note:
' ---       This combines the macro portion of readregionalmaster.prg, stifs_macrocases.prg and
macrocons.prg
'-------------------------------------------------------------------------------------------------------------

workfile c:\temp\tempmac q 1975:1 2008:4

'-----------------------------------------------------------------------
' --- 1. Read and rename latest set of national macro data
' ---  Fetch nhh and khu using c=l (last observation), and all others using c=a (average)
'-----------------------------------------------------------------------

          fetch(d="\\FS-F1\l6489\prj\eviews\macrodata.edb",c=a) *
          fetch(d="\\FS-F1\l6489\prj\eviews\macrodata.edb",c=l) nhh* khu*

' ---- rename base case variables

          rename cpi_b cicpius
          rename ecom_b emcmpus
          rename econ_b empcpus
          rename eea_b emnfpus
          rename emf_b empmpus
          rename enrm21_b empipus
          rename gdpr_b gdpqxus
          rename ifxr_b i87rxus
          rename iimr_b krdrxus
          rename ipsb50001_b zotoius
          rename ipsg311_b zo20ius
          rename ipsg322_b zo26ius
          rename ipsg324_b zo29ius
          rename ipsg325_b zo28ius
          rename ipsg3251_b zocbius
          rename ipsg3251t3_b zo28tius
          rename ipsg327_b zo32ius
          rename ipsg331_b zo33ius
          rename ipsg3311a2_b zoisius
          rename ipsgmf_b zomnius
          rename jpgdp_b gdpdius
          rename khu_b kqhmpus
```

```
        rename khups1_b kqh1pus
        rename nhh_b hholds
        rename np_b pop
        rename rmprime_b primeus
        rename ruc_b xrunr
        rename wpi_b wpcpius
        rename wpiind_05_b wpiinus
        rename yp_b py
        rename ypdr_b yd87ous
        rename ypr_b pyr
        rename ypcompwsd_b pywsd

' ---    Generate US PPI with 2000=1.0
smpl 2000:1 2000:4
        scalar ppi2000=@mean(wpcpius)
smpl @all
        genr wpi2000=wpcpius/ppi2000

' ---    Generate Real Wage Disbursements using implicit deflator for personal income
        genr pywsdr = pywsd / (py/pyr)

' ---- rename forecast scenarios.

if %4scen="Yes" then

        for %s opt pes hip lop
                rename cpi_{%s} cicpius_{%s}
                rename ecom_{%s} emcmpus_{%s}
                rename econ_{%s} empcpus_{%s}
                rename eea_{%s} emnfpus_{%s}
                rename emf_{%s} empmpus_{%s}
                rename enrm21_{%s} empipus_{%s}
                rename gdpr_{%s} gdpqxus_{%s}
                rename ifxr_{%s} i87rxus_{%s}
                rename iimr_{%s} krdrxus_{%s}
                rename ipsb50001_{%s} zotoius_{%s}
                rename ipsg311_{%s} zo20ius_{%s}
                rename ipsg322_{%s} zo26ius_{%s}
                rename ipsg324_{%s} zo29ius_{%s}
                rename ipsg325_{%s} zo28ius_{%s}
                rename ipsg3251_{%s} zocbius_{%s}
                rename ipsg3251t3_{%s} zo28tius_{%s}
                rename ipsg327_{%s} zo32ius_{%s}
                rename ipsg331_{%s} zo33ius_{%s}
                rename ipsg3311a2_{%s} zoisius_{%s}
                rename ipsgmf_{%s} zomnius_{%s}
                rename jpgdp_{%s} gdpdius_{%s}
                rename khu_{%s} kqhmpus_{%s}
                rename khups1_{%s} kqh1pus_{%s}
                rename nhh_{%s} hholds_{%s}
                rename np_{%s} pop_{%s}
                rename rmprime_{%s} primeus_{%s}
                rename ruc_{%s} xrunr_{%s}
                rename wpi_{%s} wpcpius_{%s}
                rename wpiind_05_{%s} wpiinus_{%s}
                rename yp_{%s} py_{%s}
```

```
                rename ypdr_{%s} yd87ous_{%s}
                rename ypr_{%s} pyr_{%s}
                rename ypcompwsd_{%s} pywsd_{%s}
        next

        ' ---   Generate US PPI with 2000=1.0
        smpl 2000:1 2000:4
                scalar ppi2000_{%s}=@mean(wpcpius_{%s})
        smpl @all
                genr wpi2000_{%s}=wpcpius_{%s}/ppi2000_{%s}

        ' ---   Generate Real Wage Disbursements
                genr pywsdr_{%s} = pywsd_{%s} / (py_{%s}/pyr_{%s})

endif

'Note:  Procedure for creating regional macro variables for the 4 scenarios is not available yet.

'-------------------------------------------------------------------------------------------------------------
' --- 2. Read Regional Macro Data
'
' ---  Regional Macro data are quarterly series from Global Insight, update every quarter.
' ---  Current version: USDeptEnergy110705.xls.
' ---  Copy GI file as RegionalMacro.xls, remove "RFOR:" and ".Q" from all descriptions in row 1.
'
' ---  Descriptions are in "Mnemonics" worksheet in RegionalMacro.xls.
' ---  In general, number of series=17:- 4 aggregate regions, 9 Census Divisions, 4 states
' ---  Exceptions:
' ---     POP-TotalByState: population for 50 states plus DC (51 records)
' ---     EEMxxx and IPMxxx: employment and production of detailed industries for selected states
only
'-------------------------------------------------------------------------------------------------------------

smpl 1990:1 %endregmacro

        read(b2,s=POP) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=POP-TotalByState) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 51
        read(b2,s=POP04) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=POP514) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=POP65) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=EE) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=EESPP) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=EECRM) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=EEMFG) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=EEM321) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 3
        read(b2,s=EEM327) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 3
        read(b2,s=EEM331) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 3
        read(b2,s=EEM311) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 4
        read(b2,s=EEM322) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 4
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        read(b2,s=EEM326) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 4
        read(b2,s=XRUNR) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=CWD) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=CWDSPP) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=CWDCRM) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
```

```
        read(b2,s=CWDMFG) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=CGSP) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=CGSPMFG) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=QHALL) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=QHSIZE) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=IPMFG) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=IPM327) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 3
        read(b2,s=IPM331) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 3
        read(b2,s=IPM311) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 4
        read(b2,s=IPM322) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 4
        read(b2,s=IPM324) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 2
        read(b2,s=IPM325) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 4
        read(b2,s=IPM326) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 4
        read(b2,s=CPI) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=GSP) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=GSPMFG) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=YRPIC) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17
        read(b2,s=CYRPIC) "\\fs-f1\l6489\prj\eviews\RegionalMacro.xls" 17

' ---  First create pool variables:
' ---       P_reg17 - Pool variable for 4 aggregate regions, 9 Census Divisions and 4 states
' ---       P_reg13 - Pool variable for 4 aggregate regions and 9 Census Divisions
' ---       P_states4 - Pool variable for 4 states

        pool p_reg17 NER SOR NCR WER NEC MAC SAC ESC WSC ENC WNC MTN PAC CA
FL NY TX
        pool p_reg13 NER SOR NCR WER NEC MAC SAC ESC WSC ENC WNC MTN PAC
        pool p_states4 CA FL NY TX

' ---  Rename Macro Variables and convert Population and Employment into millions

' ---       State population
        fetch(d="\\FS-F1\l6489\prj\eviews\regionalmain.edb") regnames

        for !i=1 to 51
                %str=regnames(!i,2)
                Genr POP_{%str}=POP_{%str}/1000
        next

' ---       Macro variables available for all 13 regions and 4 states

        for %v pop pop04 pop514 pop65 ee eespp eecrm eemfg
                p_reg13.genr {%v}_? = {%v}c?/1000
                p_states4.genr {%v}_? = {%v}?/1000
                p_reg13.delete {%v}c?
                p_states4.delete {%v}?
        next

        for %v xrunr cwd cwdspp cwdcrm cwdmfg cgsp cgspmfg gsp gspmfg qhall qhsize ipmfg
cpi yrpic cyrpic
                p_reg13.genr {%v}_? = {%v}c?
                p_states4.genr {%v}_? = {%v}?
                p_reg13.delete {%v}c?
                p_states4.delete {%v}?
        next
```

```
' ---       For QHALL, rename to QHALLC to indicate this variable is from Census
          for %r NER SOR NCR WER NEC MAC SAC ESC WSC ENC WNC MTN PAC CA FL NY
TX
                    rename qhall_{%r} qhallc_{%r}
          next

' ---   Variables by NAICS industry for the four states (not all available)

          for %s CA FL NY TX
                    for %v eem311 eem321 eem322 eem324 eem325 eem326 eem327 eem331
                              %str = %v + %s
                              if @isobject(%str)=1 then
                                        genr {%v}_{%s} = {%v}{%s}/1000
                                        delete {%v}{%s}
                              endif
                    next
                    for %v ipm311 ipm322 ipm324 ipm325 ipm326 ipm327 ipm331
                              %str = %v + %s
                              if @isobject(%str)=1 then
                                        genr {%v}_{%s} = {%v}{%s}
                                        delete {%v}{%s}
                              endif
                    next
          next

' ---  Set frequency conversion method for QHALLC (same as NHH in GI national model):
' ---       high frequency to low c=l (last observation)
' ---       low frequency to high c=c (cubic-match last)
' ---   All other regional concepts:
' ---       high frequency to low c=a (average)
' ---       low frequency to high c=q (quadratic-match average)
' ---       This should be the default setting

          for %r NER SOR NCR WER NEC MAC SAC ESC WSC ENC WNC MTN PAC CA FL NY
TX
                    qhallc_{%r}.setconvert l c
          next

'-------------------------------------------------------------------------------------------------------------
' --- 3. Create additional regional macro variables
'-------------------------------------------------------------------------------------------------------------

' ---       Generate regional CPI2000 (2000=1.0)

          for %r  NER SOR NCR WER NEC MAC SAC ESC WSC ENC WNC MTN PAC CA FL
NY TX
                    smpl 2000:1 2000:4
                              scalar avg2000 = @mean(cpi_{%r})
                    smpl @all
                              genr cpi2000_{%r} = cpi_{%r} / avg2000
          next

' ---       Create GSP Deflators (2000=1.0)

          p_reg17.genr DeflGSP_? = GSP_? / CGSP_?
          p_reg17.genr DeflGSPMFG_? = GSPMFG_? / CGSPMFG_?
```

```
'-------------------------------------------------------------------------------------------------------------
' ---  4. Perform macro bridge procedure '-------------------------------------------------------------------------
-------------------------------------

' --- Create a set of variables for the initial series

pool p_regstate nec mac enc wnc sac esc wsc mtn pac ca fl ny tx
pool p_reg9 nec mac enc wnc sac esc wsc mtn pac

smpl @all

        for %v cgsp cgspmfg gsp gspmfg cwd cwdmfg cwdcrm cwdspp cpi2000 deflgspmfg ipmfg
ee eemfg eecrm eespp yrpic cyrpic qhallc pop xrunr

                p_regstate.genr {%v}_?_Init={%v}_?

        next

' --- Create regional aggregates and make a set of initial series

' ---     variables that are additive
        for %v cgsp cgspmfg gsp gspmfg cwd cwdmfg cwdcrm cwdspp ee eemfg eecrm eespp
yrpic cyrpic qhallc pop
                genr {%v}_us=0

                for %r nec mac enc wnc sac esc wsc mtn pac
                        {%v}_us={%v}_us+{%v}_{%r}
                next

                genr {%v}_us_init={%v}_us

        next

' ---     variables that are not additive - use weighted average
        for %v cpi2000 deflgspmfg ipmfg xrunr
                genr {%v}_us=0
        next

        for %r nec mac enc wnc sac esc wsc mtn pac
                genr cpi2000_us=cpi2000_us+cpi2000_{%r}*cyrpic_{%r}/cyrpic_us
                genr ipmfg_us=ipmfg_us+ipmfg_{%r}*cgspmfg_{%r}/cgspmfg_us
                genr xrunr_us=xrunr_us+xrunr_{%r}*ee_{%r}/ee_us
        next

        genr deflgspmfg_us=gspmfg_us/cgspmfg_us

        for %v cpi2000 deflgspmfg ipmfg xrunr
                genr {%v}_us_init={%v}_us
        next

' ---  Create a set of _USX variables with forecast growth rates equal to the national/proxy
concept
```

```
        for %v cgsp cgspmfg gsp gspmfg cwd cwdmfg cwdcrm cwdspp cpi2000 deflgspmfg ipmfg
ee eemfg eecrm eespp yrpic cyrpic qhallc pop xrunr

                genr {%v}_usx={%v}_us
        next

' ---  Apply quarter-on-quarter growth rate of the national variable/proxy to the regional aggregates
_USX in the forecast period.

' ---        Gross state product (GSP) - use GDP
' ---        Manufacturing value-added (GSPMFG) - use proxy: manufacturing production index
' ---        Total wage disbursements (CWD) - use proxy: real wage disbursements
' ---        Wage disbursements for MFG (CWDMFG) - use proxy: real wage disbursements * mfg
employment / nonfarm employment
' ---        Wage disbursements for mining and construction (CWDCRM) - use proxy: real wage
disbursements * (mining+construction) employment / nonfarm employment
' ---        Wage disbursements for private services (CWDSPP) - use proxy: real wage
disbursements * commercial employment / nonfarm employment
' ---        CPI 2000-base (CPI2000) - use CPI
' ---        Deflator for MFG value-added (DEFLGSPMFG) - use proxy: Industrial producer price
index
' ---        Manufacturing production index (IPMFG) - use national mfg production index
' ---        Total employment (EE) - use national nonfarm employment
' ---        Employment, manufacturing (EEMFG) - use national mfg employment
' ---        Employment mining and construction (EECRM) - use national mining & construction
employment
' ---        Employment, private services (EESPP)- use national commercial employment
' ---        Nominal personal income (YRPIC) - use national
' ---        Real personal income (CYRPIC) - use national
' ---        Number of households (QHALLC) - use national
' ---        Population (POP) - use national
' ---        Unemployment rate (XRUNR) - use national

smpl %begbridge %endbridge

        genr cgsp_usx =cgsp_usx(-1)* gdpqxus  / gdpqxus(-1)

        genr cgspmfg_usx  = cgspmfg_usx(-1) * (zomnius/zomnius(-1))

        genr cwd_usx  = cwd_usx(-1)  * pywsdr / pywsdr(-1)

        genr cwdmfg_usx  = cwdmfg_usx(-1)  * (pywsdr * empmpus  / emnfpus)  / (pywsdr(-1)  *
empmpus(-1)  / emnfpus(-1))

        genr cwdcrm_usx  = cwdcrm_usx(-1)  * (pywsdr  * (empipus+empcpus)  / emnfpus)  /
(pywsdr(-1)  * (empipus(-1)+empcpus(-1))  / emnfpus(-1))

        genr cwdspp_usx  = cwdspp_usx(-1)  * (pywsdr  * emcmpus  / emnfpus)  / (pywsdr(-1)  *
emcmpus(-1)  / emnfpus(-1))

        genr cpi2000_usx  = cpi2000_usx(-1)  * cicpius  / cicpius(-1)

        genr deflgspmfg_usx  = deflgspmfg_usx(-1)  * wpiinus  / wpiinus(-1)

        genr ipmfg_usx  = ipmfg_usx(-1)  * zomnius  / zomnius(-1)
```

```
        genr ee_usx  = ee_usx(-1) * emnfpus  / emnfpus(-1)

        genr eemfg_usx  = eemfg_usx(-1)  * empmpus  / empmpus(-1)

        genr eecrm_usx  = eecrm_usx(-1)  * (empipus+empcpus)  / (empipus(-1)+empcpus(-1))

        genr eespp_usx  = eespp_usx(-1) * emcmpus  / emcmpus(-1)

        genr yrpic_usx  = yrpic_usx(-1)  * py  / py(-1)

        genr cyrpic_usx  = cyrpic_usx(-1)  * pyr  / pyr(-1)

        genr qhallc_usx  = qhallc_usx(-1)  * hholds  / hholds(-1)

        genr pop_usx  = pop_usx(-1)  * pop  / pop(-1)

        genr xrunr_usx  = xrunr_usx(-1)  * xrunr  / xrunr(-1)

' ---  Scale the regional series by the differences of the adjusted and initial series of the regional
aggregates

        for %v cgsp cgspmfg gsp gspmfg cwd cwdmfg cwdcrm cwdspp cpi2000 deflgspmfg ipmfg
ee eemfg eecrm eespp yrpic cyrpic qhallc pop xrunr
                p_reg9.genr {%v}_? = {%v}_? /{%v}_us_init * {%v}_usx
                genr {%v}_us = {%v}_usx
        next

' ---  Scale the state series by the differences of the adjusted and initial series of the regional
series

        for %v cgsp cgspmfg gsp gspmfg cwd cwdmfg cwdcrm cwdspp cpi2000 deflgspmfg ipmfg
ee eemfg eecrm eespp yrpic cyrpic qhallc pop xrunr
                for %r %rr ca pac ny mac fl sac tx wsc
                        genr {%v}_{%r} = {%v}_{%r} /{%v}_{%rr}_init * {%v}_{%rr}
                next
        next

' ---  store in temporary bank

smpl @all
db c:\temp\tempmac_q
store *
close c:\temp\tempmac_q.edb

'save c:\temp\tempmac.wf1
close tempmac.wf1
```