

Appendix D

Adjustment for Seasonal Variations

Seasonally adjusted estimates result by removing normal seasonal movement from the unadjusted data to bring out underlying trends and business cycles. Seasonal adjustment accounts for month-to-month variations resulting from normal or average changes in any phenomena affecting the data such as weather conditions, the differing lengths of months, and the varying number of weekdays and weekends within each month. It neither adjusts for abnormal conditions within each month, nor for year-to-year variations in weather. The relationship between unadjusted estimates and seasonally adjusted estimates can best be explained with the following scenario. Suppose the normal month-to-month change in an unadjusted series between February and March is 20 percent. Then an increase in the unadjusted series of less than 20 percent will be seen as a decrease in the seasonally adjusted series; an increase of exactly 20 percent will result in no change in the adjusted series; and an increase of more than 20 percent will be shown as an increase in the adjusted series.

An assumption underlying the seasonal adjustment process is that the original series can be separated into a seasonal component, a trend-cycle component, a trading day component, and an irregular component. The seasonally adjusted series consists of the trend-cycle and the irregular components taken together. The trend-cycle component includes the long-term and business cycle. The irregular component is made up of residual variations such as the sudden impact of political events, the effects of strikes, unusual weather conditions, reporting errors, and sampling errors. The trading-day component represents the effect due to the varying number of weekdays and weekends in each month. The seasonally adjusted monthly rate is found by dividing the unadjusted monthly estimate by its seasonal component and trading day components.

The seasonally adjusted annual rate is the seasonally adjusted monthly rate multiplied by 12. It is neither a forecast nor a projection. Rather it is a description of the annual rate at which construction is put in place in that particular month. Changes in the seasonally adjusted estimates may indicate changes in the trend or rate of construction put in place, but changes in the unadjusted estimates may be strictly due to seasonal variation. Seasonally adjusted annual rates facilitate comparisons with previous annual data, as well as with the seasonally adjusted annual rates for prior months.

The seasonally adjusted estimates or seasonal factors are obtained by running the unadjusted data through X-12-ARIMA. The X-12-ARIMA is a seasonal adjustment program developed at the U.S. Census Bureau. The program is based on the Bureau's earlier X-11 program and the X-11-ARIMA/88 program developed at Statistics Canada. Further information on X-12-ARIMA is available on the Internet at www.census.gov/srd/www/x12a/. Also, a list of frequently asked questions (FAQ) on seasonal adjustment may be seen at www.census.gov/const/www/faq2.html.

Each monthly series is run through the X-12-ARIMA program every month as new data become available. This procedure, known as concurrent seasonal adjustment, utilizes the current month estimate to calculate that month's seasonal adjustment factor. Several studies indicate that use of the most current data to estimate seasonal factors is generally effective; the seasonal factors are subject to less revision. Each composite monthly series was either seasonally adjusted directly or indirectly. Direct seasonal adjustment of a composite series consists of seasonally adjusting the sum of the component series. Indirect seasonal adjustment of a composite series consists of summing each seasonally adjusted component series. As the unadjusted data are revised, so are the seasonal factors (see Tables D-1 through D-4 for the most current.) Thus, changes in seasonally adjusted estimates will not only reflect changes in the unadjusted data, but also changes to the seasonal factors. In addition, the seasonally adjusted data are revised back for 3 years each year with the release of May data.

**Table D-1. Factors Used to Seasonally Adjust Estimates of the Value of Construction Put
in Place**
(Percent)

Type of Construction:	May 2002p	Apr 2002r	Mar 2002r	Feb 2002r	Jan 2002r	May 2001r
Total Construction	104.1	96.3	90.3	79.8	82.5	103.7
Residential	106.4	97.1	90.9	76.2	81.9	NA
Lodging	100.0	100.0	99.9	99.8	99.8	NA
Office	103.0	100.2	97.9	92.7	93.2	NA
Commercial	99.9	96.4	91.7	88.0	85.5	NA
Health care	101.2	100.6	98.9	96.0	96.0	NA
Educational	98.7	92.6	86.5	83.6	85.3	NA
Religious	98.1	96.4	93.4	89.9	89.9	NA
Public safety	98.8	97.5	96.7	89.4	90.5	NA
Amusement and recreation	105.3	102.8	95.7	90.2	87.6	NA
Transportation	104.3	95.3	86.4	80.2	79.1	NA
Communication	102.9	97.8	93.7	82.2	83.2	NA
Power	106.9	97.9	94.5	81.9	75.7	NA
Highway and street	106.6	85.6	67.7	56.8	59.3	NA
Sewage and waste disposal	102.4	96.3	90.8	79.4	83.7	NA
Water supply	100.3	97.8	88.9	85.3	85.7	NA
Conservation and development	97.0	92.3	90.4	93.5	88.4	NA
Manufacturing	98.6	95.8	94.6	88.2	89.2	NA
Total Private Construction ¹	104.7	97.4	92.2	80.7	83.8	104.2
Residential	106.4	97.1	90.9	76.0	81.8	106.1
Lodging	100.0	100.0	100.0	100.0	100.0	100.0
Office	102.8	100.6	99.1	93.3	93.0	102.8
Commercial	99.9	96.2	91.7	87.8	85.4	99.9
Health care	101.2	100.6	99.2	96.4	96.2	101.1
Educational	101.5	97.0	90.2	86.5	87.3	101.6
Religious	98.1	96.4	93.4	89.9	89.9	97.5
Amusement and recreation	103.9	101.4	97.5	95.1	93.3	103.7
Transportation	106.6	98.4	84.3	72.6	74.9	105.4
Communication	103.0	97.8	93.7	82.1	83.1	101.3
Power	107.3	97.6	94.2	81.2	74.9	106.5
Manufacturing	98.6	95.8	94.6	88.2	89.2	98.6

NA Not Applicable

¹ Includes the following categories of private construction not shown separately: public safety, highway and street, sewage and waste disposal, water supply, and conservation and development.

**Table D-1. Factors Used to Seasonally Adjust Estimates of the Value of Construction Put
in Place**
(Percent)

Type of Construction:	May 2002p	Apr 2002r	Mar 2002r	Feb 2002r	Jan 2002r	May 2001r
Total Public Construction ²	102.2	92.7	83.8	77.2	78.3	102.1
Residential	104.8	96.9	93.2	87.8	91.1	NA
Office	104.0	98.6	92.5	90.1	94.0	NA
Commercial	100.4	101.5	91.2	91.1	88.3	NA
Health care	101.3	100.8	97.7	94.7	95.1	NA
Educational	98.1	91.6	85.6	83.0	84.9	NA
Public safety	98.8	97.5	96.7	89.3	90.4	NA
Amusement and recreation	106.2	103.7	94.5	86.7	83.6	NA
Transportation	103.2	93.9	87.3	83.6	81.2	NA
Power	101.4	101.5	101.5	98.6	97.2	NA
Highway and street	106.7	85.6	67.7	56.7	59.3	NA
Sewage and waste disposal	102.8	96.8	90.9	79.3	83.8	NA
Water supply	100.8	98.2	89.3	85.4	86.0	NA
Conservation and development	97.0	92.3	90.3	93.5	88.3	NA
Manufacturing	98.9	94.6	95.8	92.5	89.6	NA

NA Not Applicable

² Includes the following categories of public construction not shown separately: lodging, religious, and communication.

Table D-2. Factors Used to Seasonally Adjust Estimates of the Value of Private Construction Put in Place

(Percent)

Type of Construction:	May 2002p	Apr 2002r	Mar 2002r	Feb 2002r	Jan 2002r	May 2001r
Total Private Construction	104.7	97.4	92.2	80.7	83.8	104.2
Residential (inc. Improvements)	106.4	97.1	90.9	76.0	81.8	106.1
New single family	104.0	98.1	93.2	78.8	81.8	104.1
New multi-family	107.4	102.3	96.7	90.1	91.6	105.2
Lodging	100.0	100.0	100.0	100.0	100.0	100.0
Office	102.8	100.6	99.1	93.3	93.0	102.8
General	103.0	100.2	99.7	93.4	93.4	103.2
Financial	100.1	105.8	91.5	91.8	87.0	97.0
Commercial (inc. Farm)	99.9	96.2	91.7	87.8	85.4	99.9
Automotive	100.0	98.4	95.7	91.8	91.8	99.4
Sales	100.0	100.0	100.0	100.0	100.0	100.0
Service/parts	98.0	100.6	94.2	87.4	89.3	98.1
Parking	102.6	92.3	91.2	84.8	83.6	101.2
Food/beverage	97.3	92.7	93.0	84.8	84.6	97.6
Food	97.3	92.7	93.0	84.8	84.6	97.6
Dining/drinking	97.3	92.7	93.0	84.8	84.6	97.6
Multi-retail	104.6	97.8	92.9	89.0	84.4	104.8
General merchandise	108.6	99.3	94.5	91.7	84.9	109.1
Shopping center	102.2	97.0	90.8	86.6	82.9	102.5
Shopping mall	105.3	96.4	93.7	87.2	82.5	104.9
Other commercial	98.6	95.6	90.6	87.1	81.7	98.0
Drug store	100.0	100.0	100.0	100.0	100.0	100.0
Building supply store	103.2	98.6	82.5	83.4	82.1	101.6
Other stores	96.4	93.1	90.7	84.9	77.3	96.0
Warehouse	99.6	99.8	91.7	89.4	88.3	99.8
General commercial	99.6	99.8	91.7	89.4	88.3	99.8
Mini-storage	99.6	99.8	91.7	89.4	88.3	99.8
Health Care	101.2	100.6	99.2	96.4	96.2	101.1
Hospital	102.0	100.9	99.3	97.1	92.8	101.6
Medical building	99.6	100.2	98.0	91.6	102.3	100.8
Special care	100.0	100.0	100.0	100.0	100.0	100.0
Educational	101.5	97.0	90.2	86.5	87.3	101.6
Preschool	108.4	98.7	92.2	90.3	86.0	105.7
Primary/secondary	98.2	90.9	87.3	84.6	83.4	98.4
Higher education	103.0	99.0	90.9	85.6	87.7	103.3
Instructional	101.9	98.5	90.4	82.9	88.1	101.9
Dormitory	110.2	99.6	82.5	79.4	77.9	110.0
Sports/recreation	100.0	100.0	100.0	100.0	100.0	100.0
Other educational	98.7	99.1	89.8	90.5	92.9	98.9
Gallery/museum	98.7	99.1	89.8	90.5	92.9	98.9

Table D-2. Factors Used to Seasonally Adjust Estimates of the Value of Private Construction Put in Place

(Percent)

Type of Construction:	May 2002p	Apr 2002r	Mar 2002r	Feb 2002r	Jan 2002r	May 2001r
Religious	98.1	96.4	93.4	89.9	89.9	97.5
House of worship	96.8	95.7	93.1	88.0	89.6	95.7
Other religious	101.6	98.1	94.2	94.8	90.9	101.8
Auxiliary building	101.6	98.1	94.2	94.8	90.9	101.8
Amusement and Recreation	103.9	101.4	97.5	95.1	93.3	103.7
Theme/amusement park	108.7	114.7	113.3	104.5	100.1	108.7
Sports	105.7	102.3	91.2	88.6	84.2	107.9
Fitness	100.0	100.0	100.0	100.0	100.0	100.0
Performance/meeting center	100.0	100.0	100.0	100.0	100.0	100.0
Social center	106.8	102.6	97.9	92.9	91.3	106.2
Movie theater/studio	104.7	93.8	92.4	87.7	87.1	104.7
Transportation	106.6	98.4	84.3	72.6	74.9	105.4
Air	99.1	97.5	97.7	85.0	86.6	98.3
Land	108.7	98.6	80.6	69.1	71.6	109.0
Communication	103.0	97.8	93.7	82.1	83.1	101.3
Power (inc. Gas and Oil)	107.3	97.6	94.2	81.2	74.9	106.5
Electric	107.3	97.6	94.2	81.2	74.9	106.5
Manufacturing	98.6	95.8	94.6	88.2	89.2	98.6
Food/beverage/tobacco	100.0	100.0	100.0	100.0	100.0	100.0
Chemical	100.2	99.0	95.2	94.1	85.3	100.2
Plastic/rubber	100.0	100.0	100.0	100.0	100.0	100.0
Nonmetallic mineral	100.0	100.0	100.0	100.0	100.0	100.0
Fabricated metal	85.2	83.1	98.7	91.3	87.7	83.5
Computer/electronic/electrical	100.0	100.0	100.0	100.0	100.0	100.0
Transportation equipment	100.0	100.0	100.0	100.0	100.0	100.0

Note: Total private construction includes the following categories of construction not shown separately: public safety, highway and street, sewage and waste disposal, water supply, and conservation and development

Table D-3. Factors Used to Seasonally Adjust Estimates of the Value of State and Local Construction Put in Place

(Percent)

Type of Construction:	May 2002p	Apr 2002r	Mar 2002r	Feb 2002r	Jan 2002r	May 2001r
Total State and Local Construction	102.4	92.5	82.4	75.8	77.4	102.6
Residential	104.6	96.3	89.1	85.3	92.4	104.1
Multi-family	104.7	96.3	89.1	84.8	92.4	104.3
Office	105.8	98.4	91.7	89.4	95.3	104.5
Commercial	101.0	104.0	89.1	89.6	87.1	102.4
Automotive	101.3	107.6	89.3	87.8	86.3	102.7
Parking	101.3	107.6	89.3	87.8	86.3	102.7
Health Care	102.6	102.6	95.7	94.0	96.8	103.1
Hospital	103.6	103.4	94.3	92.2	95.7	104.3
Medical building	100.0	100.0	100.0	100.0	100.0	100.0
Special care	100.0	100.0	100.0	100.0	100.0	100.0
Educational	98.0	91.5	85.2	82.7	84.8	97.8
Primary/secondary	97.3	89.7	81.1	80.2	82.9	96.9
Elementary	93.4	89.0	80.6	77.6	81.9	93.8
Middle/junior high	101.8	94.7	84.2	83.2	89.6	101.6
High	98.3	88.6	80.3	81.1	80.9	97.6
Higher education	101.0	95.4	97.3	88.2	90.3	100.8
Instructional	99.0	95.0	95.2	85.1	92.0	98.2
Dormitory	110.1	96.3	100.4	96.1	83.4	109.8
Sports/recreation	105.9	91.5	87.9	81.9	85.0	106.3
Infrastructure	100.0	100.0	100.0	100.0	100.0	100.0
Other educational	94.2	95.4	87.5	91.3	83.2	92.7
Library/archive	94.2	95.4	87.5	91.3	83.2	92.7
Public Safety	98.8	98.0	94.9	88.4	91.2	100.3
Correctional	100.4	99.0	98.1	92.1	91.3	100.9
Detention	100.4	99.0	98.1	92.1	91.3	100.9
Police/sheriff	100.4	99.0	98.1	92.1	91.3	100.9
Other public safety	93.3	94.7	85.0	77.4	90.7	97.6
Fire/rescue	93.3	94.7	85.0	77.4	90.7	97.6
Amusement and Recreation	106.4	104.2	94.7	86.8	83.8	104.8
Sports	110.7	110.3	103.4	92.2	89.9	112.5
Performance/meeting center	100.9	97.6	94.1	94.6	88.2	100.8
Convention center	100.9	97.6	94.1	94.6	88.2	100.8
Social center	104.5	95.1	85.6	73.4	81.9	104.8
Neighborhood center	104.5	95.1	85.6	73.4	81.9	104.8
Park/camp	113.5	116.1	88.0	77.8	68.2	100.9

Table D-3. Factors Used to Seasonally Adjust Estimates of the Value of State and Local Construction Put in Place

(Percent)

Type of Construction:	May 2002p	Apr 2002r	Mar 2002r	Feb 2002r	Jan 2002r	May 2001r
Transportation	103.1	94.1	86.0	82.3	81.1	102.0
Air	102.1	89.1	74.8	72.4	73.5	101.2
Passenger terminal	105.2	100.1	93.2	87.2	85.7	104.1
Runway	101.0	82.2	63.1	61.9	65.7	100.2
Land	104.8	97.2	92.0	89.7	84.1	103.8
Passenger terminal	100.0	100.0	100.0	100.0	100.0	100.0
Mass transit	100.0	100.0	100.0	100.0	100.0	100.0
Water	100.0	100.0	100.0	100.0	100.0	100.0
Dock/marina	100.0	100.0	100.0	100.0	100.0	100.0
Power	100.0	100.0	100.0	100.0	100.0	100.0
Highway and Street	107.0	85.6	67.4	56.4	59.0	107.0
Pavement	108.1	82.8	64.7	52.7	53.4	107.3
Lighting	109.8	83.6	66.4	62.9	84.6	106.7
Bridge	105.4	90.4	71.0	62.4	73.4	106.5
Rest facility	100.0	100.0	100.0	100.0	100.0	100.0
Sewage and Waste Disposal	103.8	97.5	90.4	79.2	84.1	103.6
Sewage/dry waste	103.6	96.6	88.7	77.2	83.0	103.3
Plant	102.0	95.8	88.3	80.3	84.9	102.3
Line/pump station	104.2	96.8	88.6	75.4	81.9	103.9
Waste water	104.3	99.3	93.8	82.9	86.0	104.1
Plant	105.6	100.6	96.1	84.3	87.3	106.0
Line/drain	97.5	91.4	81.8	77.0	79.5	97.7
Water Supply	101.2	97.7	87.7	85.1	85.0	101.3
Plant	104.8	100.2	95.9	90.2	90.3	105.6
Line	100.1	96.4	79.1	78.4	75.8	99.6
Pump station	100.0	100.0	100.0	100.0	100.0	100.0
Conservation and Development	98.6	92.8	82.7	91.5	82.7	98.4
Dam/levee	92.5	86.0	92.5	81.8	72.4	92.5
Breakwater/jetty	100.0	100.0	100.0	100.0	100.0	100.0

Note: Total state and local construction includes the following categories of construction not shown separately: lodging, religious, communication, and manufacturing.

Table D-4. Factors Used to Seasonally Adjust Estimates of the Value of Federal Construction Put in Place

(Percent)

	May 2002p	Apr 2002r	Mar 2002r	Feb 2002r	Jan 2002r	May 2001r
Total Federal Construction	99.2	95.2	99.5	92.7	88.5	96.4
Residential	105.1	98.4	102.5	93.2	87.5	NA
Office	99.0	99.1	94.3	92.0	90.9	NA
Commercial	98.5	92.2	97.4	95.2	92.0	NA
Health care	97.1	95.4	103.4	96.6	89.7	NA
Educational	102.1	96.4	106.4	94.2	90.3	NA
Public safety	99.0	95.8	102.8	92.7	86.9	NA
Amusement and recreation	103.2	95.6	91.1	85.8	78.9	NA
Transportation	104.6	92.3	99.0	95.7	82.6	NA
Power	108.7	107.5	106.5	92.9	79.3	NA
Highway and street	88.7	84.3	94.1	85.4	88.2	NA
Conservation and development	96.3	92.0	95.5	94.8	91.8	NA
Manufacturing	97.8	90.4	93.6	90.6	85.3	NA

NA Not Applicable

Note: Total federal construction includes the following categories of construction not shown separately: lodging, religious, communication, sewage and waste disposal, and water supply.