

Revised February 2008

**U.S. Hours and Productivity Behavior**  
**Using CPS Hours Worked Data: 1959-I to 2007-IV**

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ABSTRACT

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We construct estimates of average hours worked and labor productivity for the U.S. economy. The data are based on the Current Population Survey (CPS). The methodology and data sources are presented in detail.

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## 1. INTRODUCTION

The goals of this paper are to construct time series of average hours worked and labor productivity for the U.S. economy using the Current Population Survey (CPS). *Average hours worked* is defined as total hours worked per population ages 16 to 64. *Labor productivity* is defined as gross domestic product per total hours worked.

The primary source of data for hours and population is the *Employment and Earnings* publications of the U.S. Department of Labor, Bureau of Labor Statistics. These data are based on the CPS.

The population covered by our analysis is the non-institutional population, ages 16 to 64. We construct this series by adding CPS civilian non-institutional population ages 16 to 64 and military personnel worldwide.<sup>1</sup>

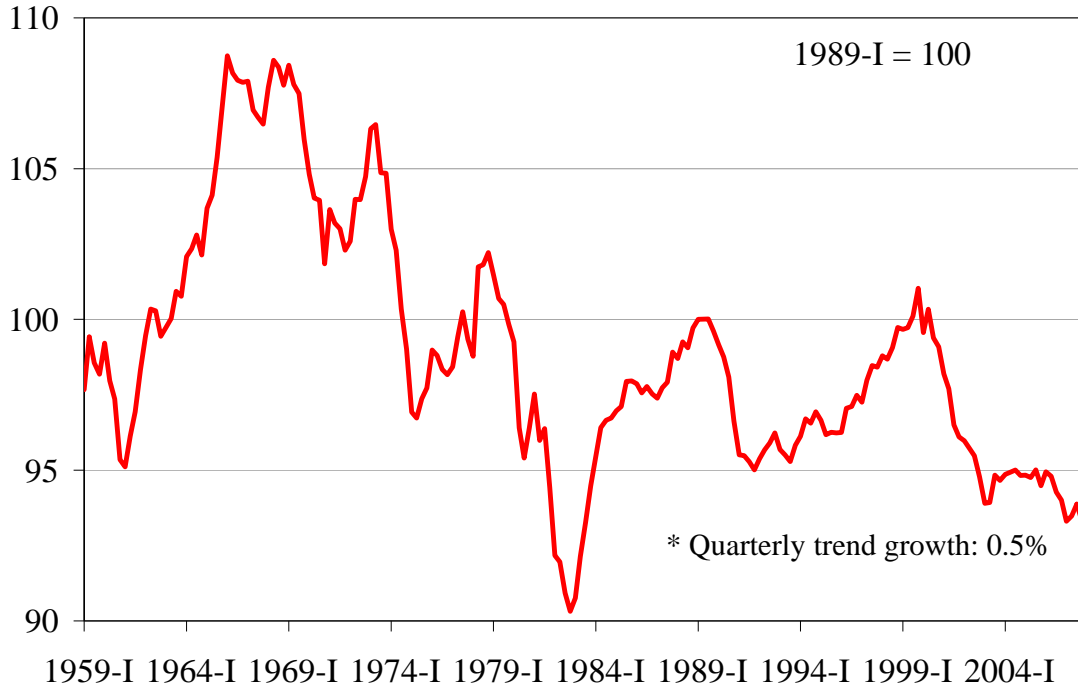
The total hours worked is constructed using CPS data on persons at work, and their weekly average hours of work. The CPS estimate of total hours **does not include military hours**. We estimate military hours and add it to the civilian hours to obtain total hours worked.

Figures 1 through 7 plot data on gross domestic product (GDP) per capita, average hours worked and labor productivity, respectively. The rest of the paper presents the methodology and data sources in detail.

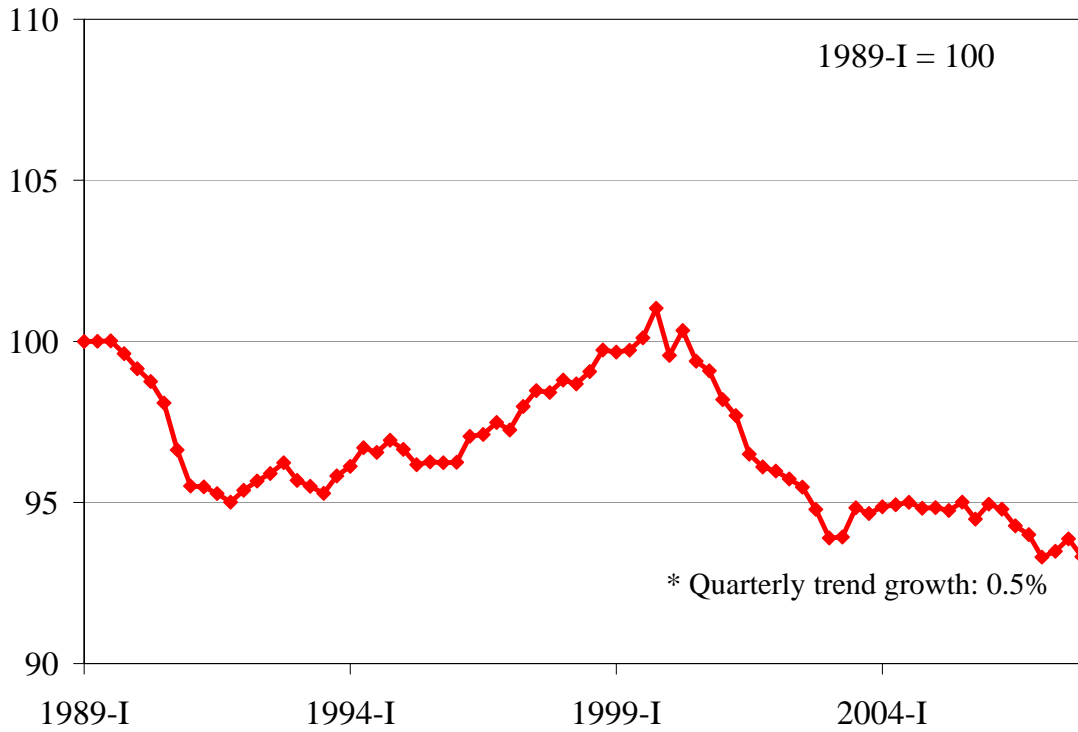
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<sup>1</sup> The gross domestic product (GDP) measure provided by the Bureau of Economic Analysis includes on the cost side the salaries to military personnel worldwide, and not only the salaries of the military personnel in the U.S. territories. This justifies adding the military personnel worldwide in our measure of population.

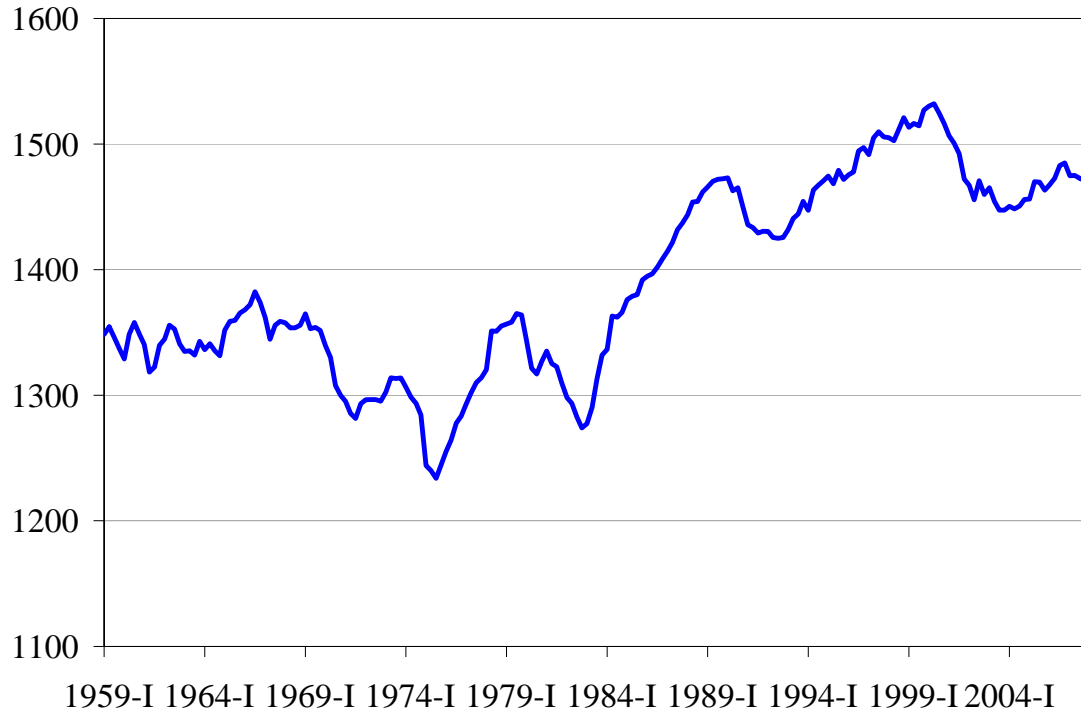
**FIGURE 1. U.S. Detrended\* GDP per Noninstitutional Pop. 16-64  
1959-I to 2007-IV**



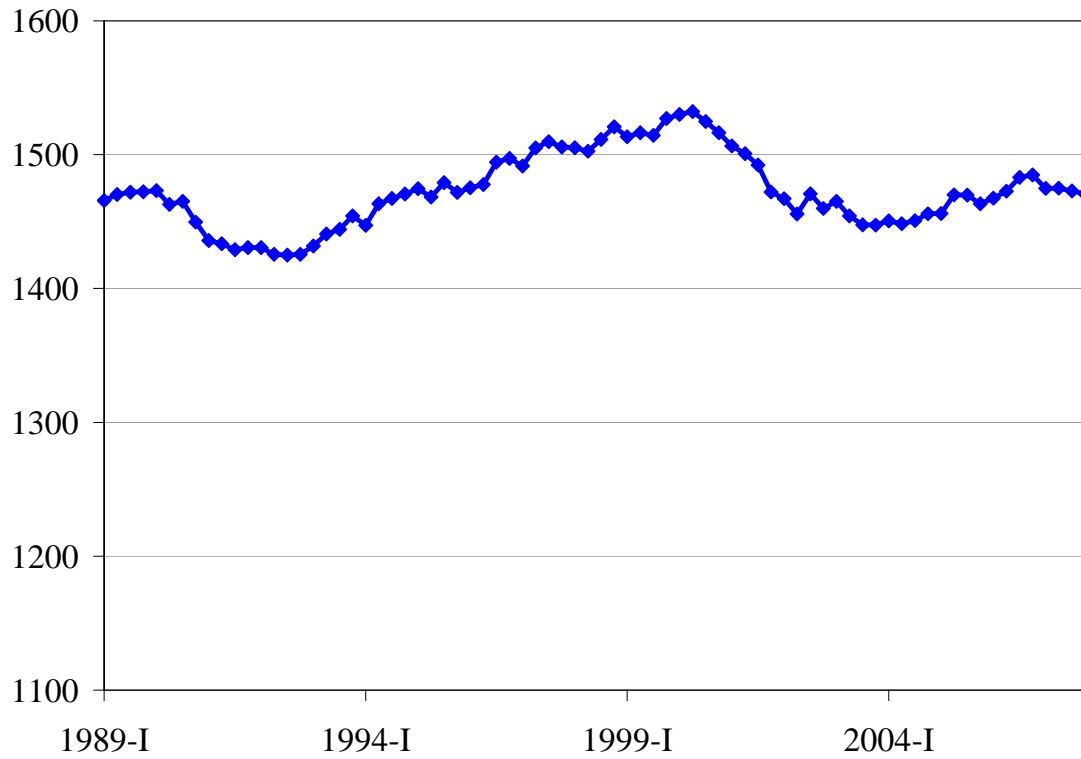
**FIGURE 2. U.S. Detrended\* GDP per Noninstitutional Pop. 16-64  
1989-I to 2007-IV**



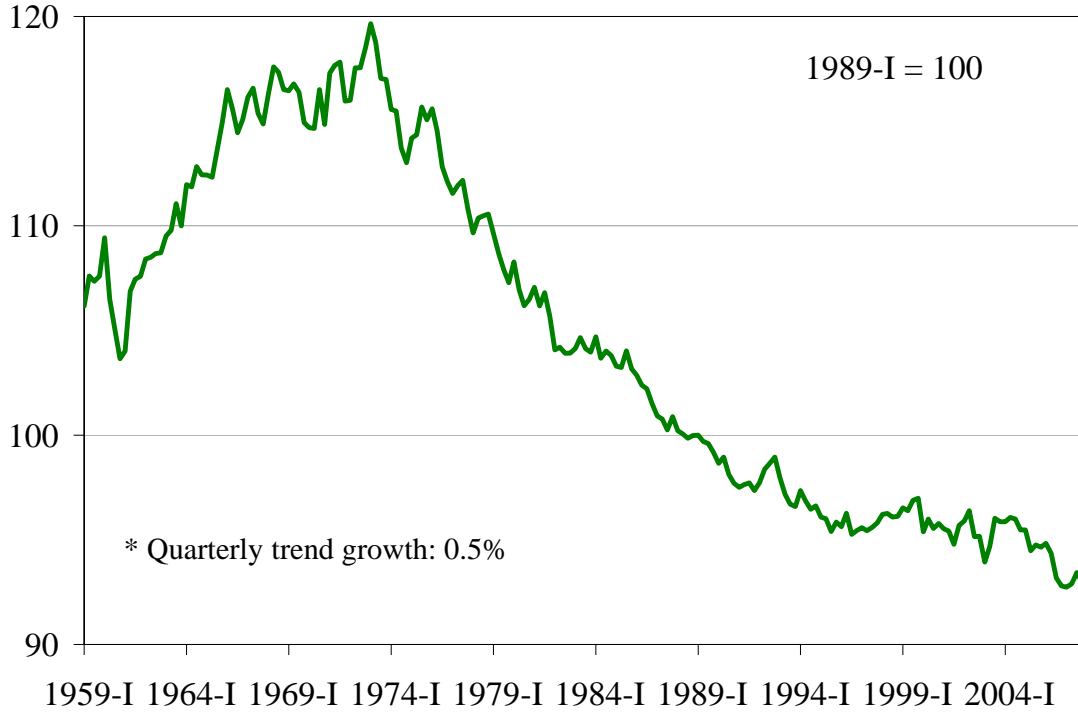
**FIGURE 3. U.S. CPS Hours Worked at Annual Rate per Noninstitutional Pop. 16-64  
1959-I to 2007-IV**



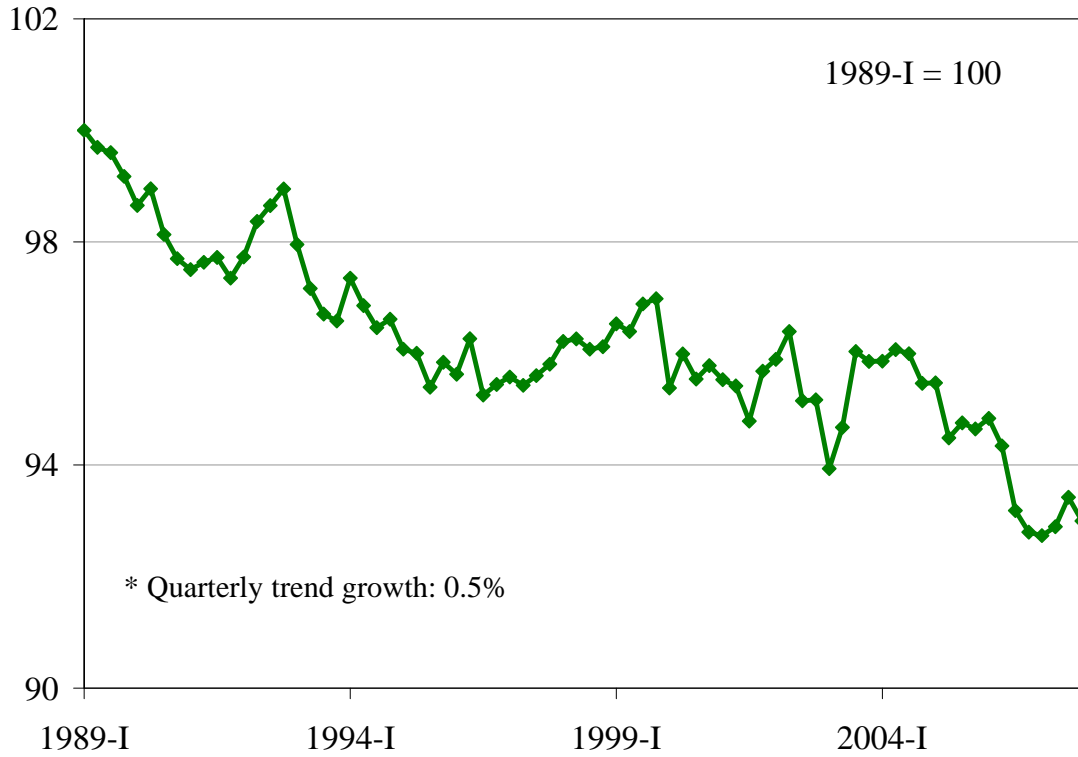
**FIGURE 4. U.S. CPS Hours Worked at Annual Rate per Noninstitutional Pop. 16-64  
1989-I to 2007-IV**



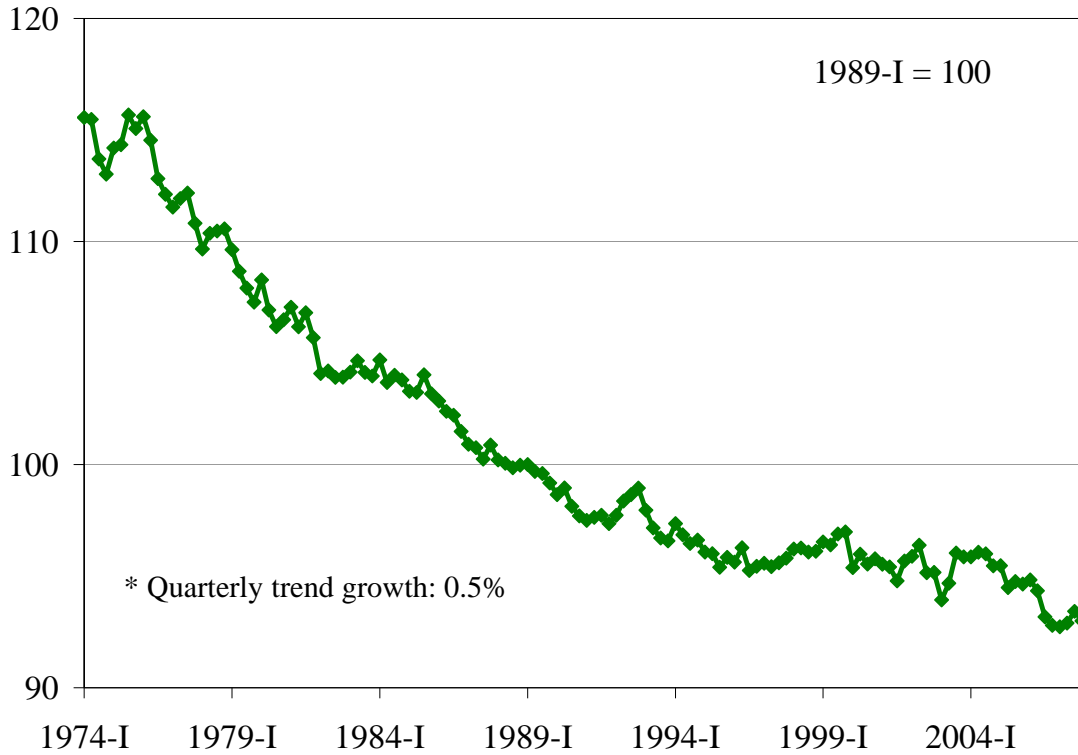
**FIGURE 5. U.S. Detrended\* GDP per CPS Hours  
1959-I to 2007-IV**



**FIGURE 6. U.S. Detrended\* GDP per CPS Hours  
1989-I to 2007-IV**



**FIGURE 7. U.S. Detrended\* GDP per CPS Hours  
1974-I to 2007-IV**



## 2. AVERAGE HOURS WORKED ESTIMATE

*Average hours worked* is defined as total hours worked per noninstitutional population ages 16 to 64. The following definitions apply:

Noninstitutional population 16-64 = Civilian population + military personnel

Total hours worked = Civilian hours + military hours

Civilian hours are constructed using CPS data on persons at work and their weekly average hours of work. Military personnel hours are calculated using military personnel data and assuming a 40 hour workweek.

For calculations, refer to Excel file “US Hours and Productivity”, worksheet “average hours worked”.

## 2.1. TOTAL CIVILIAN HOURS

For details, refer to Excel file “US Hours and Productivity”, worksheet “Data1” and “Data1b”.

Total hours worked by the civilian noninstitutional population are calculated as follows:

$$\text{Total civilian hours worked} = \text{Persons at work} \cdot \text{Hours worked per week} \cdot \frac{52}{4}$$

### *DEFINITIONS*

***Civilian noninstitutional population:*** All persons age 16 or older, that currently reside in one of the 50 states or the District Columbia and who are not inmates of institutions (e.g. penal and mental facilities, homes for the aged) and who are not on active duty in the Armed Forces.

***Employed person:*** All persons who, during the reference week (i) worked at least 1 hour as paid employees, worked in their own business, profession or on their own farm, or worked without pay for more than 15 hours in a family business or farm, or (ii) all persons who were not working, but who were temporarily absent from work due to illness, bad weather, vacation, labor-management disputes, job training or for personal reasons – whether or not they were paid for the time off.

***Persons at work:*** All employed persons who were not absent from work during the reference week.

### *DATA SOURCES*

- U.S. Department of Labor, Bureau of Labor Statistics, *Employment and Earnings* – for data prior to June 1976.

Table A-24. Persons at work in agriculture and related and in nonagricultural industries by hours of work<sup>2</sup>

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<sup>2</sup> The table number changes between different Employment and Earnings publications, but the title indicates data on persons at work by hours of work.

- U.S. Department of Labor, Bureau of Labor Statistics, <http://www.bls.gov/cps/> – for data starting June 1976 till present

Go to “BLS Program and Survey Special Notices Series ID Formats”:  
<http://data.bls.gov/cgi-bin/srgate>. Insert code “LNU02005054” to get (Unadj) Average Hours, Total At Work, All Industries. Insert code “LNU02005053” to get (Unadj) Number Employed, At Work.

### ***CALCULATIONS***

1. From the *Employment and Earnings* publications we obtain monthly data on:
  - Persons at work, and
  - Average hours worked by a person at work
2. We convert the monthly data into data on quarterly basis (see details below)
3. The series obtained are deseasonalized using the census deseasonalizer X12, multiplicative deseasonalizing as provided by E-views.
4. Total hours worked per quarter are given by the persons at work on a quarterly basis times the average hours worked per week on a quarterly basis times  $\frac{52}{4}$ .

### ***Converting monthly data into quarterly basis data***

Let  $m_i$  denote monthly data to be converted into quarterly data. Define:

$$d = \frac{\min\{m_1, m_2, m_3\}}{\text{average}\{m_1, m_2, m_3\}}$$

The quarterly basis data over those three months,  $q$ , is computed as follows:

$$q = \begin{cases} \text{average}\{m_1, m_2, m_3\}, & \text{if } d < 0.9 \\ \frac{3 \cdot \text{average}\{m_1, m_2, m_3\} - \min\{m_1, m_2, m_3\}}{2}, & \text{otherwise} \end{cases}$$

In words: If no particular value of the monthly data deviates too much from the average of those monthly data, then the value for the respective quarter is the average over all values. Otherwise, the minimum value is ignored, and the quarterly data is computed as the average of the two highest monthly values. The goal of this procedure is to sort out outliers on the low side.

Consider the following example. Table 1 presents the data for selected months of the year 1998. With the procedure described we ignore the month of September 1998 when computing the data for the third quarter of 1998.

**TABLE 1. AVERAGE HOURS WORKED PER WEEK BY A  
PERSON AT WORK, IN 1998**

Month	July	August	September	October
Hours	39.9	39.9	36.8	39.5

Note: In some years in our dataset, the data for the month of November is a large outlier relative to data in the other months of the fourth quarter. This is due to a holiday in November falling in the reference week (the reference week is the week containing the week of the 12th).

## **2.2. POPULATION DATA**

For details, refer to Excel file “US Hours and Productivity”, worksheet “Data2”.

### ***DATA SOURCES***

- U.S. Department of Labor, Bureau of Labor Statistics, <http://www.bls.gov/cps/>
  - Go to: “Get Detailed CPS Statistics”, then “Create Customized Tables”, then “Labor Force Statistics from the Current Population Survey”

### ***CALCULATIONS***

1. From the BLS webpage we downloaded on April 16, 2007 monthly data on:
  - civilian noninstitutional population, age 16 and over (Not Seasonally Adjusted)
  - civilian noninstitutional population age 65 and over (Not Seasonally Adjusted)

2. We compute quarterly data of Population 16 and over and Population 65 and over by averaging over monthly data.
3. We obtain quarterly civilian noninstitutional population ages 16 to 64.

### ***2.3. MILITARY PERSONNEL DATA***

For details, refer to Excel file “US Hours and Productivity”, worksheet “Data3”.

#### ***DATA SOURCES***

- U.S. Department of Defense, <http://www.defenselink.mil/>
  - Go to: “Websites”, then “Facts and Statistics”, then “Defense Statistics”, click on Personnel, then Military personnel.

#### ***CALCULATIONS***

1. From the Department of Defense webpage we download data on:
  - Military personnel in U.S. Territories
  - Military personnel worldwideFrom 1956 onward, these data were collected on the 30<sup>th</sup> of September of each year; data prior to 1956 were collected in June of the respective year.
2. Data collected on the 30<sup>th</sup> of September is assumed to be the data for the fourth quarter of the respective year. We obtain data for the first three quarters by linear interpolation, that is:  $m_{i,t} = \frac{4-i}{4}m_{4,t-1} + \frac{i}{4}m_{4,t}$ , where  $i = 1, 2, 3$  denotes the quarter, and  $t$  denotes the current year.

### **3. LABOR PRODUCTIVITY ESTIMATE**

*Labor productivity* is defined as gross domestic product per total hours worked.

#### ***DATA SOURCES***

- Bureau of Economic Analysis, <http://www.bea.gov>
  - Table 1.1.6 Real Gross Domestic Product (Billions of Chained (2000) dollars)

#### ***CALCULATIONS***

1. From the BEA webpage we downloaded on April 16, 2007 quarterly real GDP.
2. We construct GDP per CPS hours worked, and GDP per capita.
3. We detrend using a growth trend of 0.5% per quarter (i.e. 2% annual growth trend)

For calculations, refer to Excel file “US Hours and Productivity”, worksheet “labor productivity”.