**THE LONG-RANGE ECONOMIC ASSUMPTIONS
FOR THE 2013 TRUSTEES REPORT**

OFFICE OF THE CHIEF ACTUARY
SOCIAL SECURITY ADMINISTRATION

May 31, 2013

PRINCIPAL ECONOMIC ASSUMPTIONS

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OVERVIEW

Each year, the Board of Trustees of the Federal Old-Age and Survivors Insurance (OASI) and Disability Insurance (DI) Trust Funds provides an annual report to the Congress on the financial and actuarial status of the program. For this report, the Office of the Chief Actuary (OCACT), on behalf of the Board of Trustees, projects future cost and income based on three separate sets of long-range (75-year) assumptions for key economic variables. The intermediate (alternative II) set of assumptions represents the Trustees' best estimate for future experience, while the low cost (alternative I) and high cost (alternative III) sets of assumptions represent more and less favorable scenarios, respectively, from the perspective of program cost. The intermediate assumptions are also used as the central tendency for the stochastic projections presented in the OASDI Trustees Report. This memorandum presents the ultimate economic assumptions to be used in the 2013 Annual Report of the Board of Trustees. These are unchanged from the ones assumed for the 2012 Trustees Report.

The key economic variables include the average annual growth rates in total-economy productivity, the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W), and the gross domestic product (GDP) deflator, as well as the average OASDI real wage differential, the unemployment rate, and the annual trust fund real interest rate. Total-economy productivity is the ratio of real GDP to total hours worked. The real wage differential is the rate of change in the average OASDI covered wage less the rate of change in the CPI-W. Table A.1, below, lists the assumed ultimate (i.e., long-range future) values for these key economic variables in the 2013 Trustees Report alternatives I, II, and III, respectively.

Table A.1: Ultimate Values for Key Economic Assumptions for the Long-Range (75-year) Projection Period

Ultimate Assumptions	2013 Trustees Report Alternative			2012 Trustees Report Alternative			2013 Trustees Report Less 2012 Trustees Report		
	I	II	III	I	II	III	I	II	III
Average Percentage Change In:									
Productivity (Total-Economy)	1.98	1.68	1.38	1.98	1.68	1.38	0.00	0.00	0.00
Prices (CPI-W)	1.80	2.80	3.80	1.80	2.80	3.80	0.00	0.00	0.00
Prices (GDP Deflator)	1.50	2.40	3.30	1.50	2.40	3.30	0.00	0.00	0.00
Real Wage Differential (Percent)	1.71	1.12	0.51	1.71	1.12	0.51	0.00	0.00	0.00
Unemployment Rate (Percent)	4.5	5.5	6.5	4.5	5.5	6.5	0.0	0.0	0.0
Annual Trust Fund Real Interest Rate (Percent)	3.4	2.9	2.4	3.4	2.9	2.4	0.0	0.0	0.0

The remainder of this section provides brief descriptions and summary information for the key economic variables, as well as assumed values for **alternative II**.

Productivity - The growth rate in total-economy productivity is the largest component in the growth rate of the real wage. The historical growth rate in total-economy productivity has varied over economic cycles and longer periods. The annual growth rate in total-economy productivity averaged 1.8 percent over the 50-year period from 1961 to 2011, and 1.7 percent over the last five complete economic cycles, a 41-year period from 1966 to 2007. The Trustees have retained an ultimate growth rate assumption of 1.7 percent.

The growth rate in total-economy productivity can be viewed as a weighted average of the growth rates in economic sectors, where the weights are the shares of each sector in total GDP. The historical growth rate in total-economy productivity was boosted by a shift from the farm sector to the nonfarm sector, which has a higher level of productivity. Hence, it seems reasonable to evaluate historical growth rates in productivity by sector.

The annual growth rate in nonfarm business productivity averaged about 2.1 percent over the 50-year period from 1961 to 2011, and about 1.9 percent over the last five complete economic cycles. The Trustees assume an ultimate long-range average annual growth rate in nonfarm business productivity of 2.0 percent.

The annual growth rate in farm productivity averaged about 4.4 percent over the 50-year period from 1961 to 2011, and 4.7 percent over the last five complete economic cycles. OCACT believes that the growth rate in farm productivity was greatly influenced by a shift in workers and output from relatively small and inefficient sole proprietor farms to relatively large, more efficient corporate farms. OCACT assumes no such shift in the future and the Trustees assume an ultimate long-range growth rate in farm productivity of 2.0 percent, equal to the assumed ultimate long-range growth rate in nonfarm productivity.

The growth rates in productivity in the remaining sectors of the economy (i.e., households, nonprofit institutions, and general government) have been close to zero over the historical period, and are expected to be zero in the future. The weighted average of the assumed sector growth rates is equal to the Trustees' assumed ultimate long-range average annual growth rate in total-economy productivity of 1.7 percent.

Price Inflation - The growth rate in the CPI-W is used to set the annual increase in OASDI benefit payments. The average annual growth rate in the CPI-W was about 3.7 percent over the 50-year period from 1961 to 2011, about 4.2 percent over the last five complete economic cycles from 1966 to 2007, and about 2.6 percent over the last two complete economic cycles from 1989 to 2007. The lower growth rate over the more recent period reflects, among other things, the stronger implementation of anti-inflationary monetary policy and the effects of additional competition from emerging markets. However, the more recent period does not reflect the kind of inflationary shocks that may occur in the future. OCACT expects that monetary policy will, in general, continue to target relatively low inflation, but may not be able to fully prevent occasional bursts of inflation caused by demand and supply shocks. Thus, OCACT expects the future average growth rate in the CPI-W to be slightly higher than the more recent historical period. Accordingly, the Trustees have set the ultimate long-range average annual growth rate in the CPI-W to 2.8 percent.

The GDP deflator is another measure of price inflation. It is used in projecting the level of wages and, therefore, OASDI tax revenues. OCACT believes that the CPI-W and the GDP deflator will grow at different rates in the future due to inherent differences in their computational methods and coverage. The principal difference in computational methods is the way that groups of goods and services are weighted in computing the overall price increases. For the CPI-W, broad groups of goods and services use constant weights over 2-year periods, reflecting the distribution of purchases at the beginning of the period. For the GDP deflator, changes in the distribution of purchases from one quarter to the next are reflected in the computation of quarterly increases in price levels. When the price for one group of goods rises relative to the price of a second group, consumers tend to shift purchases from the first to the second group. The GDP deflator formula accounts for such shifts as they happen, and thus reflects to a greater degree the changes in behavior of consumers in response to price changes. Because of this computational difference, the GDP deflator tends to result in a lower measured increase compared to the CPI-W. The Bureau of Labor Statistics (BLS) estimates the effect that applying this behavioral response would have on the CPI-U for the 1990s, and publishes actual values for the 2000 to 2011 period. These data indicate that reflecting the behavioral response of consumers to price changes would lower the average annual growth rate in the CPI-W between 1990 and 2011 by 0.3 percentage point. OCACT expects the future average annual growth rate in the GDP deflator to be 0.3 percentage point below the average annual growth rate in the CPI-W due to this difference in computational methods.

The second important difference between the CPI-W and the GDP deflator is coverage. The CPI-W measures the annual growth rate in prices covered by consumer expenditures, while the GDP deflator reflects the annual growth rate in prices covered by all consumption, investment, and government expenditures. Investment expenditures include growing amounts for computers and software, two goods whose prices have fallen over the last twenty-five years and are likely to continue falling. OCACT expects that the overall price of investment goods will grow more slowly than the overall price of consumer goods. On the other hand, government expenditures include employee compensation as a significant component. As the average real wage for government employees increases, OCACT expects that the overall price of government goods will grow faster than the overall price of consumer goods. OCACT believes the net effect of difference in coverage is that the average annual growth rate in the GDP deflator will be about 0.1 percentage point lower than the average annual growth rate in the CPI-W.

Thus, the Trustees set the ultimate long-range average annual growth rate in the GDP deflator to 2.4 percent, or 0.4 percentage point below the 2.8 percent ultimate long-range average annual growth rate in the CPI-W. The price differential of 0.4 percentage point is the sum of 0.3 percentage point for computational difference and 0.1 percentage point for coverage difference.

Average Real Wage Differential – The Trustees set a pattern of assumed annual real wage differentials over the last 65 years of the 75-year projection horizon (i.e., 2022 to 2087) averaging 1.1 percent. OCACT expects the future growth rate in the average real OASDI covered wage to equal approximately the future growth rate in (1) average real U.S. wages and (2) average real U.S. earnings (which include the self-employed). Hence, the Trustees set the average annual growth rate in average real U.S. earnings to 1.1 percent over the 65-year period.

The average real U.S. earnings can be described as the product of total-economy productivity, average hours worked per week, compensation ratio, earnings ratio, and the price differential (the rate of change in the GDP deflator less the rate of change in the CPI-W). Equation 1 expresses this relationship in terms of the rates of change:

$$(1) \quad \left(1+ \begin{array}{c} \bullet \\ \text{Average} \\ \text{Real} \\ \text{Earnings} \end{array}\right) = \left(1+ \begin{array}{c} \bullet \\ \text{Total} \\ \text{Economy} \\ \text{Productivity} \end{array}\right) * \left(1+ \begin{array}{c} \bullet \\ \text{Average} \\ \text{Hours} \\ \text{Worked} \end{array}\right) * \left(1+ \begin{array}{c} \bullet \\ \text{Compensation} \\ \text{Ratio} \end{array}\right) * \left(1+ \begin{array}{c} \bullet \\ \text{Earnings} \\ \text{Ratio} \end{array}\right) * \left(1+ \begin{array}{c} \bullet \\ \text{Price} \\ \text{Differential} \end{array}\right)$$

where $\overset{\bullet}{x}$ = the rate of change in x.

Equation 2 expresses the same relationship using specific definitions for each term:

$$(2) \quad \left(1+ \overset{\bullet}{\frac{\text{Earnings}}{\text{Employment} \cdot \text{CPI}}}\right) = \left(1+ \overset{\bullet}{\frac{\text{Real GDP}}{\text{Hours}}}\right) * \left(1+ \overset{\bullet}{\frac{\text{Hours}}{\text{Employment}}}\right) * \left(1+ \overset{\bullet}{\frac{\text{Compensation}}{\text{GDPDeflator} \cdot \text{Real GDP}}}\right) * \left(1+ \overset{\bullet}{\frac{\text{Earnings}}{\text{Compensation}}}\right) * \left(1+ \overset{\bullet}{\frac{\text{GDPDeflator}}{\text{CPI}}}\right)$$

The average annual change in average hours worked per week was about -0.21 percent over the 50-year period from 1961 to 2011, but only about -0.05 percent over the last two complete economic cycles, from 1989 to 2007. Some of this slowdown in the rate of decline is due to changes in the age-sex and educational distributions of the workforce. However, even after adjusting for distributional effects, the trend rate of change in average hours worked per week over the last two economic cycles has been less than 0.1 percent per year. For the future, the Trustees set the ultimate long-range average annual rate of change in average hours worked per week to -0.05 percent.

The compensation ratio is defined as the ratio of total labor compensation (i.e., total labor earnings plus employee benefits and wage-related employer taxes) to GDP and can be viewed as the "return to labor". The Trustees expect that the return to labor (and capital) will be constant in the future and therefore set the ultimate long-range average annual rate of change in the compensation ratio to zero.

The earnings ratio is the ratio of total labor earnings (i.e., the sum of wages and self-employment income) to total labor compensation. The average annual rate of change in the earnings ratio was about -0.24 percent over the 50-year period from 1961 to 2011 and about -0.17 percent over the last four complete economic cycles from 1973 to 2007.

OCACT expects contributions to employer-sponsored group health insurance (ESI) in the future to be significantly affected by the health care legislation enacted in 2010. This expectation led to a significant change in the assumed future path of the ratio of earnings to compensation between the 2009 and 2010 Trustees Reports. For the 2009 Trustees Report, the ratio of wage and salary disbursements (WSD) to employee compensation (WSS) was assumed to decline at a fixed

"ultimate" annual rate in each of the last 65 years of the 75-year projection horizon. The assumed ultimate annual rate of change in the ratio of WSD to WSS was set to -0.2 percent. For the 2010 Trustees Report, the actuaries at the Centers for Medicare and Medicaid Services (CMS) projected components of national health care expenditures, including ESI, using "new law" assumptions (i.e., including the effect of the new health care reform legislation enacted in 2010). The more detailed CMS data enabled the projection of annual rates of change in the ratio of WSD to WSS. The resulting average annual rate of change in the ratio of wages to employee compensation (and for the earnings ratio) over the last 65 years of the projection horizon (2020 to 2085) was -0.1 percent for the 2010 Trustees Report.

For the 2013 Trustees Report, the Trustees set a path for the annual rates of change in the ratio of WSD to WSS over the last 65 years of the projection horizon (2022 to 2087) consistent with the annual rates of change over the same period from the 2012 Trustees Report. This results in an average annual rate of change in the ratio of WSD to WSS of about -0.1 percent over the last 65 years of the 75-year projection period.

Thus, the Trustees set an average annual rate of increase in average real US earnings of about 1.12 percent over the last 65 years of the 75-year projection period. This assumption reflects growth rates of 1.68 percent for total-economy productivity, -0.40 percent for the price differential, -0.11 percent for the average earnings ratio, 0.00 percent for the compensation ratio, and -0.05 percent for the average hours worked per week.

Unemployment Rate – The aggregate civilian unemployment rate, adjusted for changes in the age-sex distribution of the labor force, averaged about 5.5 percent over the last four complete economic cycles from 1973 to 2007. In the future, OCACT believes that the projected decline in the overall growth rate in the labor force will put some downward pressure on the aggregate unemployment rate. The Trustees set the ultimate long-range civilian age-sex adjusted unemployment rate to 5.5 percent.

Annual Trust Fund Real Interest Rate – The real interest rate (real effective annual yield) on the special public debt obligations issuable to the trust funds for a given year is defined as the nominal effective annual yield less the increase in the CPI-W for the first year after issue. Future real interest rates on long-term Treasury securities will likely depend on the market view of the stability and solidity of the domestic financial markets and the domestic economy. Real ex-post (actual) interest rates on long-term Treasury securities averaged 3.17 percent over the last five economic cycles (from 1966 to 2007).

The Trustees set the assumed ultimate long-range real interest rate to 2.9 percent, the same ultimate real interest rate in the 2012 Report. The Trustees believe that this assumption is appropriate, in spite of the Federal government's expected increase in debt over the short-range period. OCACT believes that this ultimate assumption is consistent with a fiscally sustainable path over the remainder of the long-range period.

1. PRODUCTIVITY

THE 2013 TRUSTEES REPORT

OFFICE OF THE CHIEF ACTUARY, SOCIAL SECURITY ADMINISTRATION

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1.1   Summary

For the 2013 Trustees Report, the Trustees set the assumed ultimate annual rates of increase in total-economy productivity[1] to 1.98 percent, 1.68 percent, and 1.38 percent for alternatives I, II, and III, respectively,[2] as shown in Table 1.1. These rates of increase are the same as those used in the 2012 Trustees Report. It is important to note that the assumed rates of increase for total-economy productivity for the 2013 Trustees Report are consistent with assumed ultimate annual rates of increase in nonfarm business productivity of 2.39 percent, 2.03 percent, and 1.67 percent for alternatives I, II, and III, respectively.

Table 1.1: Assumed Ultimate Annual Rates of Increase in Total Economy Productivity

	2013 Trustees Report Alternative			2012 Trustees Report Alternative			2013 Trustees Report Less 2012 Trustees Report		
	I	II	III	I	II	III	I	II	III
Total-Economy Productivity	1.98	1.68	1.38	1.98	1.68	1.38	0.0	0.0	0.0

Total-economy productivity is defined as the ratio of real gross domestic product (GDP) to total hours worked by all workers in the U.S. economy. The Bureau of Economic Analysis (BEA) estimates historical values for real GDP in its National Income and Product Accounts (NIPA). The Bureau of Labor Statistics (BLS) provides total hours worked in an unpublished series based mostly on data from its Current Employment Statistics (CES) Survey.

This section is divided into three subsections. The first reviews BEA and BLS revisions to the real GDP and total hours worked since the 2012 Report. The second decomposes total-economy productivity by major sector and analyzes differences in sector productivity growth over several periods. A final subsection provides alternative long-run assumptions from private forecasters.

1.2   BEA and BLS Revisions to Productivity since the 2012 Report

On July 27, 2012, BEA revised real GDP back to 2009 as part of its annual revision to the NIPA.[3] Compared to the unrevised data, BEA raised the average annual growth rate in the real GDP by 0.4 percent for 2009, mostly due to upward revisions to inventory investment and state

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[1] Total-economy productivity is defined as the ratio of total real gross domestic product (GDP) to total hours worked by all workers.

[2] The precise values of the productivity assumptions are rounded to more than one decimal place to allow them to be fully consistent with rounded growth rate assumptions for the real-wage differential and certain links between these variables.

[3] "Gross Domestic Product: Second Quarter of 2012" BEA, News Release, July 27, 2012. http://www.bea.gov/newsreleases/national/gdp/2012/gdp2q12_adv.htm.

and local government spending. BEA also lowered the average annual growth rate in real GDP by 0.6 percent for 2010, due in part to downward revisions in personal consumption expenditures and inventory investment. Since the BLS made no substantive changes to the level of total hours worked for 2010 and earlier, the BEA revisions raised the annual growth rate in total-economy productivity by about 0.4 percent for 2009, and lowered the annual growth rate by about 0.6 percent for 2010.

1.3 Productivity Growth Rates by Major Sectors and Over Long Time Periods and Economic Cycles[4]

Table 1.2: Historical Average Annual Rates of Increase in Total-Economy Productivity and Its Components (%)

	Total Economy	Nonfarm Business	Farm	Households	Nonprofit Institutions	General Government
1961-2011 (50 years)	1.82	2.07	4.37	4.64	0.47	0.05
1961-1986 (25 years)	1.95	2.11	5.34	4.97	0.90	0.04
1986-2011 (25 years)	1.68	2.04	3.40	4.32	0.04	0.06
Economic Cycles						
Last One - 2000-2007 (7 years)	2.06	2.55	3.53	0.88	-0.41	0.18
Last Two - 1989-2007 (18 years)	1.87	2.27	4.52	4.19	-0.11	-0.12
Last Three - 1979-2007 (28 years)	1.67	1.95	4.75	3.96	0.01	0.06
Last Four - 1973-2007 (34 years)	1.56	1.81	4.61	3.96	0.07	0.00
Last Five - 1966-2007 (41 years)	1.68	1.92	4.68	4.31	0.33	0.03

Table 1.3: Ultimate Average Annual Rates of Increase in Total-Economy Productivity and Its Components for the 2013 Trustees Report

I	1.98	2.39	2.39	1.98	0.00	0.00
II	1.68	2.03	2.03	1.68	0.00	0.00
III	1.38	1.67	1.67	1.38	0.00	0.00

Table 1.2 lists the average annual rates of increase in productivity for the total economy and its major sectors over the last one, two, three, four, and five complete economic cycles, and over the last 50 years from 1961 to 2011. The major sectors include nonfarm business, farm, households, nonprofit institutions, and general government. Listed in Table 1.3 are the assumed ultimate average annual rates of increase in productivity for the total economy and its major sectors. For

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[4] Peaks in economic cycles roughly follow the NBER cycle dating, except for short recoveries such as 1980-81, which are not counted as separate cycles.

the ultimate assumptions, OCACT assumes that the relative size of employment by sector will stabilize.

The annual growth rate in productivity can vary from its trend growth rate over an economic cycle, assuming employers are slow to adjust labor to changes in output. Going into a recession, the growth rate in productivity may drop below trend, as employers reduce output faster than labor. During an economic recovery, the growth rate in productivity may rise above trend, as employers increase output using their existing stock of labor. Productivity growth rates also vary over longer periods that may span multiple cycles. For example, the growth rate in total-economy productivity was 2.7 percent over the 25-year period from 1948 to 1973, 1.2 percent over the 22-year period from 1973 to 1995, and 2.0 percent over the 16-year period from 1995 to 2011. Hence, it seems reasonable to analyze productivity growth rates over several economic cycles and long timespans, such as the latest 50-year period from 1961 to 2011, or even longer periods. [5]

However, setting the ultimate long-range assumption for the annual rate of increase in productivity to its average value over some long-range historical period has its limitations. First, the NIPA data are less reliable in earlier periods.[6] BEA began measuring income in the mid-1930s, and output in the early to mid-1940s.[7] It then "backcasted" both measures to 1929. Based on conversations with BEA analysts, the agency did not introduce the more modern methods of sampling, collecting, and processing of data until 1948, and did not simultaneously collect and balance income and output data until the early 1950s. Consequently, it seems reasonable to limit the use of historical data to the last forty to fifty years. Compound annual rates of growth for total-economy labor productivity for approximately the past five decades are shown in Table 1.4.

A second important limitation derives from the fact that a significant portion of the total historical average annual rate of increase in total-economy productivity is due to shifts in workers from relatively low- to high-productivity jobs. For example, over the 50-year period from 1961 to 2011, the ratio of agricultural to total-economy hours worked declined from about 0.072 to 0.016, and the ratio of agricultural to total nominal GDP declined from about 0.034 to 0.009. Meanwhile, the average *level* of productivity for agricultural workers in 2011 was about 42 percent of the average *level* of productivity for all other workers.

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[5] Ferguson, Roger W. and William L. Wascher. "Distinguished Lecture on Economics in Government: Lessons from Past Productivity Booms," *Journal of Economic Perspectives*. Volume 18, Number 2 (Spring 2004), pp. 3-28.

[6] The reliability of NIPA data for the most recent years is also questionable, since they are subject to the greatest number of revisions.

[7] BEA, "GDP: One of the Great Inventions of the 20th Century," *Survey of Current Business*, January 2000, p. 7.

This shift complicates the consideration of historical experience. The assumed ultimate long-range value for the annual rate of increase in total-economy productivity should be consistent with the average value over a long-range historical period with adjustment for differences between conditions of the past and conditions expected for the future. The average long-range historical value is inflated due to sectoral shifts in employment that are not expected to continue into the future.[8] This problem can be resolved by removing the effects of sectoral shifts in employment from the historical record or, more simply, by setting the ultimate long-range value for the annual rate of increase in total-economy productivity to a weighted average of the expected ultimate long-range values for the annual rate of increase in productivity for each sector.

1.3.1 Sector Productivity Growth Rates

1.3.1.1 Nonfarm Business (NFB)

The average annual growth rate in NFB productivity was 2.55 percent over the last economic cycle (i.e., a 7-year period from 2000 to 2007), and 2.27 percent over the last two economic cycles (18-year period from 1989 to 2007). These relatively high growth rates reflect the heavy influence of the post-1995 "new economy" characterized by rapid improvements in computers and their assimilation into the economy.

Looking at longer periods, the average annual growth rate in NFB productivity was 1.95 percent over the last three economic cycles (28-year period from 1979 to 2007), 1.81 percent over the last four economic cycles (34-year period from 1973 to 2007), and 1.92 percent over the last five economic cycles (41-year period from 1966 to 2007). These productivity growth rates include the effects of a relatively low growth rate period from 1973 to 1995. This slowdown has been attributed to a shift in employment from relatively high-productivity manufacturing jobs to low-productivity service jobs, and to the influx of new unskilled baby-boomers into the workforce. Historical compound annual rates of growth in labor productivity for the nonfarm business sector are shown in Table 1.5.

On balance, OCACT believes that the 1.92 percent average annual growth rate for NFB productivity over the last five economic cycles (1966 to 2007) is somewhat below the most reasonable assumption for the ultimate growth rate. Although the evidence for faster productivity growth from the last two economic cycles is still unclear (for example, the average annual growth rate in NFB productivity was only 1.68 percent over the 4-year period from 2003 to 2007), OCACT believes that somewhat greater weight should be placed on more recent experience to the degree that it better reflects the conditions expected generally for the future. Thus, OCACT believes it is reasonable to assume an ultimate rate of increase in NFB productivity of 2.03 percent.[9]

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[8] For example, the 0.056 decline (i.e., from 0.072 to 0.016) in the ratio of agriculture to total-economy hours worked over the last fifty years can't be repeated in the future since the level of the ratio in 2011 is 0.016.

1.3.1.2   Farm

The average annual growth rate in farm productivity was about 4.37 percent from 1961 to 2011. OCACT believes that a significant portion of the relatively high growth rate in farm productivity was due to a shift in farm operation and ownership from smaller farms run by the self-employed to more efficient larger farms run by corporations. For example, based on BLS' Current Population Survey (CPS) data, the ratio of self-employed to all workers in the agricultural sector fell from about 0.53 in 1961 to 0.38 in 2011. For the long-range future, this shift is expected to slow and the difference in the productivity growth rates between the farm and nonfarm sectors is expected to decline to zero. Thus, OCACT believes it is reasonable to set the assumed ultimate average annual growth rate in farm productivity to 2.03 percent, or equal to the assumed ultimate average annual growth rate in NFB productivity.

1.3.1.3   Nonprofit Institutions (NI)

The average annual rate of increase in NI productivity was 0.90 percent over the 25-year period from 1961 to 1986, 0.04 percent over the 25-year period from 1986 to 2011, and 0.47 percent over the combined 50-year period from 1961 to 2011. OCACT believes that these positive values in the growth rates in NI productivity, and the declining values over time, are due to shifts in employment within the NI sector.

In the NIPA, NI labor compensation accounts for about 86 percent of NI nominal GDP. NI compensation is summed from five subsectors including education, health, social, religious, and business services. For each subsector, the level of real output is defined as the product of the level of average compensation per hour in a base year (presently 2005) and the level of hours worked. This means that the *level* of productivity in each subsector is a constant (i.e., the average compensation per hour in a base year), and that the *growth rate* in productivity in each sector is zero. However, this also means that the *level* of productivity for the total NI sector is a weighted average of the *levels* of productivity in the subsectors, and that the *growth rate* in total NI productivity may be positive (or negative), due to shifts in employment from sectors with relatively low (high) average compensation to sectors with relatively high (low) compensation.

In fact, BEA data indicate that the average annual compensation in health services in 2011 is higher than the average annual compensation in other service sectors, and that the growth in employment in health services over the 25-year period from 1961 to 1986 is higher than the growth in employment in other service sectors. The NIPA include data on compensation and full-time equivalent employment in health care, educational services, and social assistance.[10]

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[9] This average annual growth rate of 2.03 percent includes a 0.03 percentage point adjustment to recognize that the productivity growth rate in the pre-1978 period would have been higher had the CPI been constructed using today's definition (see Appendix 2.1).

[10] BEA, NIPA, Tables 6.2B through 6.2D and Tables 6.5B through 6.5D.
http://www.bea.gov/iTable/iTable.cfm?ReqID=9&step=1

These three sectors are mostly composed of NI workers.[11] The data show that the level of average annual compensation for full-time equivalent employment in 2011 was $65,700, $50,800, and $33,500 in health care, educational services, and social assistance, respectively. The data also show that the ratio of full-time equivalent employment in the health sector to the total for all three sectors rose from about 0.44 in 1961 to 0.61 in 1986, and remained relatively constant thereafter.

Thus, the data indicate that the relative increase in employment in health services significantly contributed to the average annual rate of increase in NI productivity of 0.90 percent over the 25-year period from 1961 to 1986. The data also indicate that the subsequent relative stability in the growth rates in employment across NI subsectors significantly contributed to the decline in the NI productivity growth rate to 0.04 percent over the 25-year period from 1986 to 2011. In the future, it seems reasonable to assume that this historical trend in employment will continue, and that the ultimate long-range growth rates in employment in the NI subsectors will be roughly equal.[12] Thus, OCACT believes it reasonable to set the assumed ultimate long-range growth rate in NI productivity to zero.

1.3.1.4   General Government (GOV)

The average annual rate of increase in GOV productivity was 0.4 percent over the 25-year period from 1961 to 1986 and 0.06 percent over the 25-year period from 1986 to 2011. OCACT believes that these relatively small growth rates in GOV productivity are due to shifts in employment within the GOV sector.

GOV labor compensation accounts for about 85 percent of GOV nominal GDP. GOV compensation is summed from three primary subsectors: federal civilian, federal military, and state and local government. As with the NI subsector, the *level* of productivity in each subsector is a constant (i.e., the average compensation per hour in a base year), and the *growth rate* in productivity in each sector is zero. However, this also means that the *level* of productivity for the total GOV sector is a weighted average of the *levels* of productivity in the subsectors, and that the *growth rate* in total GOV productivity may be positive (negative), due to shifts in employment from sectors with relatively low (high) average compensation to sectors with relatively high (low) compensation.[13]

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[11] BEA, "Income and Outlays of Households and of Nonprofit Institutions Serving Households," *Survey of Current Business*, April 2003, p. 14.
http://www.bea.gov/scb/pdf/2003/04april/0403household.pdf

[12] Given that the overall assumptions reflect a continued growth in the health sector as a percent of GDP, this faster growth is assumed to occur in the for-profit sector of the economy.

[13] BEA, "Government Transactions, Methodology Papers: U.S. National Income and Product Accounts," September 2005, http://www.bea.gov/national/pdf/mp5.pdf

OCACT believes that the relatively small, positive growth rate in GOV productivity is due to shifts in employment among and within the subsectors. For example, it may be due to a changing distribution of employment by grade level related to the aging of the federal civilian workforce, or to a shift from a draft to a volunteer army. If so, in the future, the growth rate in GOV productivity could be negative, reflecting a reversal of historical trends. For the future, however, it seems reasonable to assume that the ultimate long-range growth rates in employment in the GOV subsectors will be about equal and that the ultimate long-range growth rate in GOV productivity will be zero.

1.3.1.5 Households

In the NIPA, nominal GDP in the household sector is the sum of the nominal compensation of private household workers and the nominal imputed output of owner-occupied housing (IOH). In 2010, the nominal compensation of private household workers made up only about 2.0 percent of the total nominal GDP in the household sector. Though this component is relatively small, it is useful to analyze each component of GDP in the household sector.

Compensation of Household Workers - As with NI and GOV compensation sectors, BEA sets the growth rate in real GDP equal to the growth rate in hours worked. Hence, the growth rate in productivity is, by definition, zero.

Imputed Output of Owner-Occupied Housing (IOH) - Renters of apartments and homes pay rent and receive streams of housing services. BEA includes these business transactions in the NIPA. Though the owners of homes pay no rent and have no business transactions, they receive similar streams of housing services. Hence, for consistency, BEA estimates the real and nominal values of housing services received by those who own their own homes (i.e., real and nominal IOH) and includes these amounts in the NIPA.

BEA's inclusion of real IOH creates a problem. Since real IOH has no associated measure of labor hours worked, how is it included when estimating historical and projecting future growth rates in sector and total-economy productivity? There are two approaches in handling real IOH in projections of total-economy productivity for the long-range.

First, total real GDP could be projected as the sum of projections for real IOH and real GDP less IOH. Real GDP less IOH would be the product of the total-economy-less-IOH productivity and total hours worked. The ultimate average annual growth rate in total-economy-less-IOH productivity could be set to the weighted average of the assumed ultimate average annual growth rates in sector productivity.[14] Real IOH could be projected as a fixed ratio to total real GDP less IOH.[15] Total-economy productivity could then be constructed as the ratio of the sum of real IOH and real GDP less IOH to total hours worked.

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[14] Sector weights would be defined as the ratio of sector to total nominal GDP less IOH.

[15] Over the 30-year period from 1981 to 2011, the ratio of real IOH to real GDP less IOH has been mostly constant and averaged 0.074.

As a second and equivalent approach, household productivity could be defined as the sum of real IOH and real output of private household workers to the total hours worked of private household workers (as in Table 1.2). Using this definition, the average annual rate of increase in productivity for private household workers over the 50-year period from 1961 to 2011 was about 4.64 percent. In the future, however, the average annual growth rate in productivity for private household workers is expected to be much lower. In fact, it is expected to equal the average annual growth rate of total-economy-less-IOH productivity, as described in the first approach.[16] The ultimate average annual growth rate in total-economy productivity could be set to the weighted average of the assumed ultimate average annual growth rates in sector productivity.[17] Finally, total real GDP would be the product of total-economy productivity and hours worked.

1.3.2 Total-Economy Productivity Growth Rate

The assumed ultimate growth rate in total-economy productivity is equal to a weighted average of the growth rates in sector productivity and employment (see Appendix 1.1). This relationship is simplified by assuming that the ultimate long-range growth rate in employment in all sectors of the economy will be about equal, and that the ultimate long-range growth rates in productivity for the nonprofit institution, and general government sectors will be zero. Given these assumptions, the ultimate long-range growth rate in total-economy productivity is equal to the weighted average of the ultimate long-range growth rates in productivity in the farm, nonfarm business, and household sectors of the economy.

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[16] If,

$$P_{ph} = \text{Real IOH} / H_{ph}$$
$$P_{xph} = \text{Real GDP less IOH} / H_{xph}$$

Then,

$$\dot{P}_{ph} = \dot{\text{Real IOH}} - \dot{H}_{ph}$$
$$\dot{P}_{xph} = \dot{\text{Real GDP less IOH}} - \dot{H}_{xph}$$

Assuming,

$$\dot{\text{Real IOH}} = \dot{\text{Real GDP less IOH}}$$
$$\dot{H}_{ph} = \dot{H}_{xph}$$

Then,

$$\dot{P}_{ph} = \dot{P}_{xph}$$

Where,

P_{ph} = Productivity, private household
P_{xph} = Productivity, total economy less private household
H_{ph} = Hours worked, private household
H_{xph} = Hours worked, total economy less private household
$\dot{Y}$ = Rate of change in Y

[17] In this second approach, sector weights would be defined as the ratio of sector to total nominal GDP.

Sector weights are defined as the ratio of sector to total nominal GDP. This "nominal output" weight for the farm sector declined from about 0.034 in 1961 to 0.009 in 2011, and has averaged about 0.008 over the last business cycle from 2000 to 2007. The nominal output weight for the nonfarm business sector was much more stable. It averaged 0.759 over the 25-year period from 1962 to 1986, 0.755 over the 25-year period from 1987 to 2011, and 0.759 over the last business cycle. For the future, OCACT believes the ultimate long-range values for the nominal output weights will remain at 0.76 for the nonfarm business sector and 0.01 for the farm sector.

The nominal weight for the household sector rose from about 0.053 in 1978 to 0.070 in 2011. As mentioned, the increase in the weight occurred because the GDP deflator for IOH grew faster than the GDP deflator for all other goods over the period. In the future, OCACT expects the GDP deflator for IOH will grow at about the same rate as the GDP deflator for all other goods and that therefore the nominal weight for the household sector should stabilize at its recent historical value of 0.07.

Sector weights can also be defined as the ratio of sector to total nominal GDP excluding IOH. In this case, the ultimate long-range values for the nominal output weights will be 0.0108 (i.e., 0.01 / (1.0 − 0.07)) for the farm sector, and 0.8172 (i.e., 0.76 / (1.0 − 0.07)) for the nonfarm sector.

This analysis suggests that the long-range future growth rate in productivity for the total economy excluding IOH will be about 1.68 percent (i.e., 2.03 * (0.8172 + 0.0108)). It also suggests that the long-range future growth rate in productivity for the total economy including IOH will be about 1.68 percent (i.e., 2.03 * (0.76 + 0.01) + 1.68 * 0.07). Thus, for the 2013 Trustees Report, the Trustees set the ultimate annual rates of increase in total-economy productivity to 1.98 percent, 1.68 percent, and 1.38 percent for alternatives I, II, and III, respectively. These rates of increase are the same as those used in the 2012 Trustees Report.

1.4   Projections from Other Forecasters

Global Insight, Inc. includes projections through 2042 in its latest long-run trend forecast (see August 2012 30-year US Macro Trend Projection). Over the 20-year period from 2022 to 2042, Global Insight, Inc. projects that the average annual rate of increase in productivity will be about 2.1 percent for the nonfarm business sector and 1.7 percent for the total economy. Macroeconomic Advisers' latest published long-run forecast (*Long-Term Economic Outlook*, Third Quarter, 2012) extends through 2021. For 2020 and 2021, it projects average annual growth rates in productivity of about 2.0 percent for the nonfarm business sector and about 1.7 percent for the total economy. Moody's Analytics' August 2012 forecast extends to 2042. For the 20-year period from 2022 to 2042, Moody's Analytics projects the average annual growth rate in productivity will be about 1.7 percent for the nonfarm business sector and 1.5 percent for the total economy.

The Office of Management and Budget (OMB) Mid-Session Review of the Fiscal Year 2013 Budget includes projections through 2090. The OMB annual growth rate for the total-economy productivity was 1.8 percent for 2021 through 2090. The Congressional Budget Office (CBO)

June 2012 report, *The 2012 Long-Term Budget Outlook*, includes projections through 2087. CBO's annual growth rate for total-economy productivity was 1.7 percent for 2022 and later. The Social Security Advisory Board's 2011 Technical Panel on Assumptions and Methods recommended assuming an ultimate (i.e., long-range average) annual rate of increase in total-economy productivity of 1.7 percent for alternative II.

Table 1.4: Total-Economy Productivity: Compound Annual Rates of Growth (%) (Index of Output per Hour in the Total Economy, base year = 2005)

To	Variable	From 1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
1961	44.06																		
1962	45.58	3.46																	
1963	47.20	3.50	3.55																
1964	48.67	3.37	3.33	3.11															
1965	50.07	3.25	3.18	3.00	2.88														
1966	51.53	3.18	3.11	2.97	2.90	2.92													
1967	52.26	2.88	2.77	2.58	2.40	2.16	1.41												
1968	53.81	2.90	2.80	2.66	2.54	2.43	2.19	2.98											
1969	54.17	2.62	2.49	2.32	2.16	1.99	1.68	1.81	0.66										
1970	55.24	2.54	2.43	2.27	2.13	1.98	1.75	1.87	1.32	1.98									
1971	57.34	2.67	2.58	2.46	2.37	2.29	2.16	2.35	2.14	2.89	3.81								
1972	58.77	2.65	2.57	2.47	2.39	2.31	2.21	2.38	2.23	2.76	3.15	2.49							
1973	60.25	2.64	2.57	2.47	2.40	2.34	2.26	2.40	2.28	2.70	2.94	2.50	2.52						
1974	59.70	2.36	2.27	2.16	2.06	1.97	1.86	1.92	1.74	1.96	1.96	1.35	0.79	-0.91					
1975	61.33	2.39	2.31	2.21	2.12	2.05	1.95	2.02	1.89	2.09	2.11	1.69	1.43	0.89	2.73				
1976	62.80	2.39	2.31	2.22	2.15	2.08	2.00	2.06	1.95	2.14	2.16	1.83	1.67	1.39	2.57	2.40			
1977	63.45	2.31	2.23	2.14	2.06	1.99	1.91	1.96	1.85	2.00	2.00	1.70	1.55	1.30	2.06	1.72	1.04		
1978	63.98	2.22	2.14	2.05	1.97	1.90	1.82	1.86	1.75	1.87	1.85	1.58	1.43	1.21	1.75	1.42	0.94	0.83	
1979	64.24	2.12	2.04	1.95	1.87	1.80	1.71	1.74	1.62	1.72	1.69	1.43	1.28	1.08	1.48	1.17	0.76	0.62	0.41
1980	64.25	2.01	1.92	1.83	1.75	1.68	1.59	1.60	1.49	1.56	1.52	1.27	1.12	0.92	1.23	0.93	0.57	0.41	0.21
1981	65.74	2.02	1.95	1.86	1.78	1.72	1.64	1.65	1.55	1.63	1.60	1.38	1.25	1.10	1.39	1.16	0.92	0.89	0.91
1982	65.44	1.90	1.82	1.73	1.66	1.59	1.50	1.51	1.41	1.46	1.42	1.21	1.08	0.92	1.15	0.93	0.69	0.62	0.56
1983	67.19	1.94	1.86	1.78	1.71	1.65	1.57	1.58	1.49	1.55	1.52	1.33	1.22	1.10	1.32	1.15	0.97	0.96	0.98
1984	68.56	1.94	1.87	1.79	1.73	1.67	1.60	1.61	1.53	1.58	1.56	1.38	1.29	1.18	1.39	1.25	1.10	1.11	1.16
1985	69.80	1.94	1.87	1.79	1.73	1.67	1.61	1.62	1.54	1.60	1.57	1.41	1.33	1.23	1.43	1.30	1.18	1.20	1.25
1986	71.38	1.95	1.89	1.81	1.76	1.70	1.64	1.65	1.58	1.64	1.62	1.47	1.40	1.31	1.50	1.39	1.29	1.32	1.38
1987	71.72	1.89	1.83	1.76	1.70	1.65	1.59	1.60	1.52	1.57	1.55	1.41	1.34	1.25	1.42	1.31	1.21	1.23	1.28
1988	72.50	1.86	1.80	1.73	1.67	1.62	1.56	1.57	1.50	1.55	1.52	1.39	1.32	1.24	1.40	1.30	1.20	1.22	1.26
1989	73.07	1.82	1.76	1.70	1.64	1.59	1.53	1.54	1.47	1.51	1.48	1.36	1.29	1.21	1.36	1.26	1.17	1.18	1.22
1990	74.32	1.82	1.76	1.70	1.64	1.59	1.54	1.54	1.48	1.52	1.49	1.37	1.31	1.24	1.38	1.29	1.21	1.22	1.26
1991	75.21	1.80	1.74	1.68	1.63	1.58	1.52	1.53	1.47	1.50	1.48	1.37	1.31	1.24	1.37	1.28	1.21	1.22	1.25
1992	77.70	1.85	1.79	1.73	1.68	1.64	1.59	1.60	1.54	1.58	1.56	1.46	1.41	1.35	1.47	1.40	1.34	1.36	1.40
1993	78.09	1.80	1.75	1.69	1.64	1.60	1.55	1.56	1.50	1.54	1.52	1.41	1.36	1.31	1.42	1.35	1.29	1.31	1.34
1994	78.80	1.78	1.73	1.67	1.62	1.58	1.53	1.53	1.48	1.51	1.49	1.39	1.34	1.29	1.40	1.33	1.27	1.28	1.31
1995	78.84	1.73	1.67	1.62	1.57	1.52	1.48	1.48	1.42	1.45	1.43	1.34	1.29	1.23	1.33	1.26	1.20	1.21	1.24
1996	80.78	1.75	1.70	1.64	1.60	1.55	1.51	1.51	1.46	1.49	1.47	1.38	1.33	1.28	1.38	1.32	1.27	1.28	1.30
1997	81.98	1.74	1.69	1.64	1.59	1.55	1.51	1.51	1.46	1.49	1.47	1.38	1.34	1.29	1.39	1.33	1.28	1.29	1.31
1998	83.75	1.75	1.70	1.65	1.61	1.57	1.53	1.53	1.49	1.51	1.50	1.41	1.37	1.33	1.42	1.36	1.32	1.33	1.36
1999	86.10	1.78	1.73	1.68	1.64	1.61	1.57	1.57	1.53	1.56	1.54	1.46	1.42	1.38	1.48	1.42	1.38	1.40	1.42
2000	88.49	1.80	1.76	1.71	1.67	1.64	1.60	1.61	1.57	1.60	1.58	1.51	1.47	1.43	1.53	1.48	1.44	1.46	1.48
2001	90.55	1.82	1.78	1.73	1.69	1.66	1.62	1.63	1.59	1.62	1.61	1.53	1.50	1.47	1.56	1.51	1.47	1.49	1.52
2002	93.41	1.85	1.81	1.77	1.73	1.70	1.67	1.67	1.64	1.67	1.66	1.59	1.56	1.52	1.61	1.57	1.54	1.56	1.59
2003	96.28	1.88	1.84	1.80	1.76	1.74	1.70	1.71	1.68	1.71	1.70	1.63	1.61	1.58	1.66	1.62	1.60	1.62	1.65
2004	98.51	1.89	1.85	1.81	1.78	1.75	1.72	1.73	1.69	1.72	1.72	1.65	1.63	1.60	1.68	1.65	1.62	1.64	1.67
2005	100.00	1.88	1.84	1.80	1.77	1.74	1.71	1.72	1.69	1.72	1.71	1.65	1.62	1.60	1.68	1.64	1.62	1.64	1.67
2006	100.82	1.86	1.82	1.78	1.75	1.72	1.69	1.70	1.67	1.69	1.69	1.63	1.60	1.57	1.65	1.62	1.59	1.61	1.64
2007	102.04	1.84	1.81	1.77	1.74	1.71	1.68	1.69	1.65	1.68	1.67	1.61	1.59	1.56	1.64	1.60	1.58	1.60	1.62
2008	102.79	1.82	1.78	1.74	1.71	1.69	1.66	1.66	1.63	1.66	1.65	1.59	1.57	1.54	1.61	1.58	1.55	1.57	1.59
2009	105.02	1.83	1.79	1.75	1.72	1.70	1.67	1.68	1.64	1.67	1.66	1.61	1.58	1.56	1.63	1.59	1.57	1.59	1.61
2010	108.19	1.85	1.82	1.78	1.75	1.73	1.70	1.71	1.68	1.70	1.69	1.64	1.62	1.59	1.67	1.64	1.61	1.63	1.66
2011	108.44	1.82	1.78	1.75	1.72	1.69	1.67	1.67	1.64	1.67	1.66	1.61	1.58	1.56	1.63	1.60	1.57	1.59	1.61

Table 1.4. Total-Economy Productivity: Compound Annual Rates of Growth (%) (continued)

To	Variable	From 1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1978	63.98																	
1979	64.24	0.41																
1980	64.25	0.21	0.00															
1981	65.74	0.91	1.16	2.32														
1982	65.44	0.56	0.62	0.92	-0.46													
1983	67.19	0.98	1.13	1.50	1.10	2.67												
1984	68.56	1.16	1.31	1.64	1.41	2.36	2.04											
1985	69.80	1.25	1.39	1.67	1.51	2.17	1.92	1.81										
1986	71.38	1.38	1.52	1.77	1.66	2.20	2.04	2.04	2.27									
1987	71.72	1.28	1.39	1.58	1.46	1.85	1.65	1.51	1.37	0.48								
1988	72.50	1.26	1.35	1.52	1.41	1.72	1.53	1.41	1.28	0.78	1.09							
1989	73.07	1.22	1.30	1.44	1.33	1.59	1.41	1.28	1.15	0.79	0.94	0.79						
1990	74.32	1.26	1.33	1.47	1.37	1.60	1.45	1.35	1.26	1.01	1.19	1.24	1.70					
1991	75.21	1.25	1.32	1.44	1.35	1.56	1.42	1.33	1.25	1.05	1.19	1.23	1.45	1.20				
1992	77.70	1.40	1.47	1.60	1.53	1.73	1.63	1.58	1.54	1.42	1.61	1.74	2.07	2.25	3.31			
1993	78.09	1.34	1.40	1.51	1.44	1.62	1.51	1.46	1.41	1.29	1.43	1.49	1.67	1.66	1.90	0.50		
1994	78.80	1.31	1.37	1.47	1.40	1.56	1.46	1.40	1.36	1.24	1.35	1.40	1.52	1.47	1.57	0.71	0.92	
1995	78.84	1.24	1.29	1.37	1.31	1.44	1.34	1.28	1.23	1.11	1.19	1.20	1.27	1.19	1.19	0.49	0.48	0.05
1996	80.78	1.30	1.36	1.44	1.38	1.52	1.43	1.38	1.34	1.24	1.33	1.36	1.44	1.40	1.44	0.98	1.14	1.25
1997	81.98	1.31	1.36	1.44	1.39	1.51	1.43	1.38	1.35	1.27	1.35	1.37	1.45	1.41	1.45	1.08	1.22	1.33
1998	83.75	1.36	1.41	1.48	1.43	1.55	1.48	1.44	1.41	1.34	1.42	1.45	1.53	1.50	1.55	1.26	1.41	1.53
1999	86.10	1.42	1.48	1.55	1.51	1.63	1.56	1.53	1.51	1.45	1.54	1.58	1.65	1.65	1.71	1.48	1.64	1.79
2000	88.49	1.48	1.54	1.61	1.58	1.69	1.63	1.61	1.59	1.55	1.63	1.67	1.76	1.76	1.82	1.64	1.80	1.95
2001	90.55	1.52	1.57	1.65	1.61	1.72	1.67	1.65	1.64	1.60	1.68	1.72	1.80	1.81	1.87	1.72	1.87	2.01
2002	93.41	1.59	1.64	1.72	1.69	1.80	1.75	1.73	1.73	1.70	1.78	1.83	1.91	1.92	1.99	1.86	2.01	2.15
2003	96.28	1.65	1.70	1.77	1.75	1.86	1.82	1.80	1.80	1.78	1.86	1.91	1.99	2.01	2.08	1.97	2.12	2.25
2004	98.51	1.67	1.72	1.80	1.77	1.88	1.84	1.83	1.83	1.81	1.88	1.93	2.01	2.03	2.10	2.00	2.14	2.26
2005	100.00	1.67	1.72	1.79	1.76	1.86	1.82	1.81	1.81	1.79	1.86	1.91	1.98	2.00	2.06	1.96	2.08	2.19
2006	100.82	1.64	1.68	1.75	1.73	1.82	1.78	1.77	1.77	1.74	1.81	1.85	1.91	1.92	1.97	1.88	1.98	2.07
2007	102.04	1.62	1.67	1.73	1.71	1.79	1.76	1.74	1.74	1.72	1.78	1.81	1.87	1.88	1.93	1.83	1.93	2.01
2008	102.79	1.59	1.63	1.69	1.67	1.75	1.72	1.70	1.70	1.67	1.73	1.76	1.81	1.82	1.86	1.76	1.85	1.92
2009	105.02	1.61	1.65	1.71	1.69	1.77	1.73	1.72	1.72	1.69	1.75	1.78	1.83	1.84	1.87	1.79	1.87	1.93
2010	108.19	1.66	1.70	1.75	1.73	1.81	1.78	1.77	1.77	1.75	1.80	1.84	1.89	1.90	1.93	1.86	1.94	2.00
2011	108.44	1.61	1.65	1.70	1.68	1.76	1.72	1.71	1.71	1.69	1.74	1.77	1.81	1.82	1.85	1.77	1.84	1.90

To	Variable	From 1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1994	78.80																	
1995	78.84	0.05																
1996	80.78	1.25	2.46															
1997	81.98	1.33	1.97	1.48														
1998	83.75	1.53	2.03	1.82	2.16													
1999	86.10	1.79	2.23	2.15	2.49	2.82												
2000	88.49	1.95	2.34	2.30	2.58	2.79	2.77											
2001	90.55	2.01	2.33	2.31	2.52	2.64	2.55	2.33										
2002	93.41	2.15	2.45	2.45	2.64	2.77	2.75	2.74	3.16									
2003	96.28	2.25	2.53	2.54	2.72	2.83	2.83	2.85	3.12	3.08								
2004	98.51	2.26	2.51	2.51	2.66	2.74	2.73	2.72	2.85	2.70	2.32							
2005	100.00	2.19	2.41	2.40	2.51	2.57	2.52	2.48	2.51	2.30	1.91	1.51						
2006	100.82	2.07	2.26	2.24	2.32	2.35	2.28	2.20	2.17	1.93	1.55	1.16	0.82					
2007	102.04	2.01	2.17	2.15	2.21	2.22	2.15	2.06	2.01	1.78	1.46	1.18	1.02	1.22				
2008	102.79	1.92	2.06	2.03	2.08	2.07	1.99	1.89	1.83	1.61	1.32	1.07	0.92	0.98	0.74			
2009	105.02	1.93	2.07	2.04	2.09	2.08	2.01	1.92	1.87	1.69	1.46	1.29	1.23	1.37	1.45	2.16		
2010	108.19	2.00	2.13	2.11	2.16	2.16	2.10	2.03	2.00	1.85	1.68	1.57	1.59	1.78	1.97	2.59	3.03	
2011	108.44	1.90	2.01	1.98	2.02	2.01	1.94	1.87	1.82	1.67	1.50	1.38	1.36	1.47	1.53	1.80	1.62	0.23

Table 1.5: Productivity in the Nonfarm Business Sector: Compound Annual Rates of Growth (%) (Index of Output per Hour in the Nonfarm Business Sector, base year = 2005)

To	Variable	From 1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
1961	39.50																		
1962	41.29	4.53																	
1963	42.74	4.02	3.51																
1964	43.99	3.65	3.22	2.93															
1965	45.35	3.51	3.18	3.01	3.09														
1966	46.97	3.52	3.27	3.20	3.33	3.57													
1967	47.79	3.23	2.97	2.83	2.80	2.65	1.75												
1968	49.42	3.25	3.04	2.95	2.95	2.91	2.58	3.41											
1969	49.51	2.86	2.63	2.48	2.39	2.21	1.77	1.78	0.17										
1970	50.25	2.71	2.48	2.34	2.24	2.07	1.70	1.68	0.83	1.49									
1971	52.25	2.84	2.65	2.54	2.49	2.39	2.15	2.26	1.87	2.73	3.99								
1972	53.99	2.88	2.72	2.63	2.59	2.52	2.35	2.47	2.23	2.93	3.65	3.32							
1973	55.68	2.90	2.76	2.68	2.65	2.60	2.46	2.58	2.41	2.98	3.48	3.23	3.14						
1974	54.79	2.55	2.39	2.28	2.22	2.12	1.94	1.97	1.73	2.05	2.19	1.59	0.74	-1.61					
1975	56.30	2.56	2.41	2.32	2.27	2.18	2.03	2.07	1.88	2.16	2.30	1.88	1.41	0.55	2.75				
1976	58.17	2.61	2.48	2.40	2.36	2.29	2.16	2.21	2.06	2.33	2.47	2.17	1.88	1.47	3.04	3.34			
1977	59.08	2.55	2.42	2.34	2.29	2.23	2.11	2.14	2.00	2.24	2.34	2.07	1.82	1.49	2.55	2.45	1.56		
1978	59.86	2.48	2.35	2.27	2.22	2.16	2.04	2.07	1.93	2.13	2.21	1.96	1.74	1.46	2.24	2.07	1.44	1.31	
1979	59.62	2.31	2.18	2.10	2.05	1.97	1.85	1.86	1.72	1.88	1.92	1.66	1.43	1.14	1.70	1.44	0.82	0.45	-0.40
1980	59.46	2.18	2.05	1.96	1.90	1.82	1.70	1.69	1.55	1.68	1.70	1.45	1.21	0.94	1.37	1.10	0.55	0.21	-0.33
1981	60.30	2.14	2.01	1.93	1.87	1.80	1.68	1.67	1.54	1.66	1.67	1.44	1.24	1.00	1.38	1.15	0.72	0.51	0.24
1982	59.66	1.98	1.86	1.77	1.71	1.63	1.51	1.49	1.35	1.44	1.44	1.21	1.00	0.77	1.07	0.83	0.42	0.19	-0.08
1983	62.28	2.09	1.98	1.90	1.85	1.78	1.67	1.67	1.55	1.65	1.67	1.47	1.31	1.13	1.43	1.27	0.98	0.88	0.80
1984	63.53	2.09	1.98	1.91	1.85	1.79	1.69	1.69	1.58	1.68	1.69	1.52	1.37	1.21	1.49	1.35	1.11	1.04	1.00
1985	64.57	2.07	1.96	1.89	1.84	1.78	1.69	1.69	1.58	1.67	1.69	1.52	1.39	1.24	1.50	1.38	1.17	1.12	1.09
1986	66.56	2.11	2.01	1.94	1.90	1.84	1.76	1.76	1.67	1.76	1.77	1.63	1.51	1.38	1.63	1.53	1.36	1.33	1.34
1987	66.75	2.04	1.94	1.88	1.83	1.77	1.69	1.69	1.59	1.67	1.69	1.54	1.43	1.30	1.53	1.43	1.26	1.23	1.22
1988	67.85	2.02	1.93	1.87	1.82	1.77	1.69	1.68	1.60	1.67	1.68	1.55	1.44	1.33	1.54	1.45	1.29	1.27	1.26
1989	68.37	1.98	1.89	1.82	1.78	1.73	1.65	1.64	1.56	1.63	1.63	1.51	1.40	1.29	1.49	1.40	1.25	1.22	1.22
1990	69.63	1.97	1.88	1.82	1.78	1.73	1.65	1.65	1.57	1.64	1.64	1.52	1.42	1.32	1.51	1.43	1.29	1.27	1.27
1991	70.70	1.96	1.87	1.81	1.77	1.72	1.65	1.65	1.57	1.63	1.64	1.52	1.43	1.34	1.51	1.43	1.31	1.29	1.29
1992	73.53	2.02	1.94	1.89	1.85	1.81	1.74	1.74	1.67	1.73	1.75	1.64	1.56	1.47	1.65	1.58	1.47	1.47	1.48
1993	73.94	1.98	1.90	1.84	1.81	1.76	1.69	1.69	1.62	1.69	1.69	1.59	1.51	1.43	1.59	1.53	1.42	1.41	1.42
1994	74.70	1.95	1.87	1.82	1.78	1.74	1.67	1.67	1.60	1.66	1.67	1.57	1.49	1.41	1.56	1.50	1.40	1.39	1.39
1995	75.00	1.90	1.83	1.77	1.74	1.69	1.63	1.62	1.56	1.61	1.62	1.52	1.44	1.36	1.51	1.44	1.35	1.33	1.34
1996	76.94	1.92	1.85	1.80	1.76	1.72	1.66	1.66	1.59	1.65	1.65	1.56	1.49	1.42	1.56	1.50	1.41	1.40	1.40
1997	78.12	1.91	1.84	1.79	1.76	1.71	1.65	1.65	1.59	1.64	1.65	1.56	1.49	1.42	1.55	1.50	1.41	1.41	1.41
1998	80.41	1.94	1.87	1.82	1.79	1.75	1.69	1.69	1.64	1.69	1.69	1.61	1.54	1.48	1.61	1.56	1.48	1.48	1.49
1999	83.08	1.98	1.91	1.86	1.83	1.80	1.74	1.74	1.69	1.74	1.75	1.67	1.61	1.55	1.68	1.63	1.56	1.56	1.57
2000	85.90	2.01	1.95	1.90	1.88	1.84	1.79	1.79	1.74	1.79	1.80	1.73	1.67	1.62	1.74	1.70	1.64	1.64	1.66
2001	88.41	2.03	1.97	1.93	1.90	1.87	1.82	1.83	1.78	1.83	1.84	1.77	1.72	1.66	1.79	1.75	1.69	1.69	1.71
2002	92.45	2.10	2.04	2.00	1.97	1.94	1.90	1.90	1.86	1.91	1.92	1.86	1.81	1.76	1.89	1.85	1.80	1.81	1.83
2003	95.85	2.13	2.08	2.04	2.02	1.99	1.95	1.95	1.91	1.96	1.98	1.91	1.87	1.83	1.95	1.92	1.87	1.88	1.90
2004	98.39	2.14	2.09	2.05	2.03	2.01	1.96	1.97	1.93	1.98	2.00	1.94	1.89	1.85	1.97	1.94	1.89	1.91	1.93
2005	100.00	2.13	2.08	2.04	2.02	2.00	1.96	1.96	1.92	1.97	1.99	1.93	1.89	1.85	1.96	1.93	1.89	1.90	1.92
2006	100.89	2.11	2.05	2.02	2.00	1.97	1.93	1.93	1.90	1.94	1.96	1.90	1.86	1.82	1.93	1.90	1.85	1.86	1.88
2007	102.46	2.09	2.04	2.01	1.99	1.96	1.92	1.92	1.89	1.93	1.94	1.89	1.85	1.81	1.91	1.89	1.84	1.85	1.87
2008	103.10	2.06	2.01	1.98	1.95	1.93	1.89	1.89	1.86	1.90	1.91	1.85	1.81	1.78	1.88	1.85	1.80	1.81	1.83
2009	106.13	2.08	2.03	2.00	1.98	1.95	1.91	1.92	1.88	1.92	1.94	1.88	1.84	1.81	1.91	1.88	1.84	1.85	1.86
2010	109.41	2.10	2.05	2.02	2.00	1.98	1.94	1.95	1.91	1.95	1.96	1.91	1.88	1.84	1.94	1.92	1.88	1.88	1.90
2011	110.17	2.07	2.02	1.99	1.97	1.95	1.91	1.92	1.88	1.92	1.93	1.88	1.85	1.81	1.91	1.88	1.84	1.85	1.87

Table 1.5. Productivity in the Nonfarm Business Sector: Compound Annual Rates of Growth (%) (continued) base year = 2005

To	Variable	From 1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1978	59.86																	
1979	59.62	-0.40																
1980	59.46	-0.33	-0.27															
1981	60.30	0.24	0.57	1.41														
1982	59.66	-0.08	0.02	0.16	-1.06													
1983	62.28	0.80	1.10	1.56	1.63	4.40												
1984	63.53	1.00	1.28	1.67	1.76	3.20	2.01											
1985	64.57	1.09	1.34	1.66	1.73	2.67	1.82	1.63										
1986	66.56	1.34	1.59	1.90	2.00	2.78	2.24	2.35	3.08									
1987	66.75	1.22	1.42	1.67	1.71	2.27	1.75	1.66	1.68	0.29								
1988	67.85	1.26	1.45	1.66	1.70	2.17	1.73	1.66	1.67	0.97	1.65							
1989	68.37	1.22	1.38	1.56	1.58	1.97	1.57	1.48	1.44	0.90	1.21	0.76						
1990	69.63	1.27	1.42	1.59	1.61	1.95	1.61	1.54	1.52	1.13	1.42	1.30	1.84					
1991	70.70	1.29	1.43	1.59	1.61	1.91	1.60	1.54	1.52	1.22	1.45	1.38	1.69	1.54				
1992	73.53	1.48	1.63	1.79	1.82	2.11	1.86	1.84	1.87	1.67	1.95	2.03	2.45	2.76	4.00			
1993	73.94	1.42	1.55	1.69	1.71	1.97	1.73	1.70	1.71	1.51	1.72	1.73	1.98	2.02	2.26	0.55		
1994	74.70	1.39	1.51	1.64	1.66	1.89	1.67	1.63	1.63	1.45	1.62	1.61	1.78	1.77	1.85	0.79	1.03	
1995	75.00	1.34	1.45	1.56	1.57	1.78	1.56	1.52	1.51	1.34	1.47	1.44	1.55	1.50	1.49	0.66	0.72	0.41
1996	76.94	1.40	1.51	1.62	1.64	1.83	1.64	1.61	1.61	1.46	1.59	1.58	1.70	1.68	1.70	1.14	1.34	1.49
1997	78.12	1.41	1.51	1.62	1.63	1.81	1.63	1.60	1.60	1.47	1.58	1.58	1.68	1.66	1.68	1.22	1.38	1.50
1998	80.41	1.49	1.59	1.69	1.71	1.88	1.72	1.70	1.70	1.59	1.71	1.71	1.82	1.82	1.86	1.50	1.69	1.86
1999	83.08	1.57	1.67	1.78	1.80	1.97	1.82	1.80	1.82	1.72	1.84	1.86	1.97	1.98	2.04	1.76	1.96	2.15
2000	85.90	1.66	1.75	1.86	1.88	2.05	1.91	1.90	1.92	1.84	1.96	1.98	2.10	2.12	2.19	1.96	2.17	2.36
2001	88.41	1.71	1.81	1.91	1.93	2.09	1.97	1.96	1.98	1.91	2.03	2.06	2.17	2.19	2.26	2.07	2.26	2.44
2002	92.45	1.83	1.93	2.03	2.06	2.21	2.10	2.11	2.13	2.07	2.19	2.23	2.35	2.39	2.47	2.32	2.51	2.70
2003	95.85	1.90	2.00	2.10	2.13	2.28	2.18	2.19	2.22	2.17	2.29	2.33	2.44	2.49	2.57	2.44	2.63	2.81
2004	98.39	1.93	2.02	2.12	2.15	2.30	2.20	2.21	2.24	2.19	2.31	2.35	2.46	2.50	2.57	2.46	2.63	2.79
2005	100.00	1.92	2.01	2.10	2.13	2.27	2.18	2.18	2.21	2.17	2.27	2.31	2.40	2.44	2.51	2.39	2.55	2.69
2006	100.89	1.88	1.97	2.05	2.08	2.21	2.12	2.12	2.15	2.10	2.20	2.23	2.32	2.35	2.40	2.29	2.42	2.54
2007	102.46	1.87	1.95	2.04	2.06	2.19	2.10	2.10	2.12	2.08	2.17	2.19	2.27	2.30	2.35	2.24	2.36	2.46
2008	103.10	1.83	1.91	1.99	2.01	2.13	2.04	2.04	2.06	2.01	2.09	2.11	2.19	2.20	2.24	2.14	2.24	2.33
2009	106.13	1.86	1.94	2.02	2.04	2.16	2.07	2.07	2.09	2.05	2.13	2.15	2.22	2.24	2.28	2.18	2.28	2.37
2010	109.41	1.90	1.98	2.05	2.08	2.19	2.11	2.11	2.13	2.09	2.17	2.20	2.26	2.29	2.32	2.23	2.33	2.41
2011	110.17	1.87	1.94	2.01	2.03	2.14	2.06	2.06	2.08	2.04	2.11	2.13	2.19	2.21	2.24	2.15	2.24	2.31

To	Variable	From 1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1994	74.70																	
1995	75.00	0.41																
1996	76.94	1.49	2.58															
1997	78.12	1.50	2.06	1.53														
1998	80.41	1.86	2.35	2.23	2.94													
1999	83.08	2.15	2.59	2.59	3.13	3.32												
2000	85.90	2.36	2.75	2.79	3.22	3.36	3.40											
2001	88.41	2.44	2.78	2.82	3.14	3.21	3.16	2.92										
2002	92.45	2.70	3.03	3.11	3.43	3.55	3.62	3.74	4.56									
2003	95.85	2.81	3.11	3.19	3.47	3.57	3.64	3.72	4.12	3.68								
2004	98.39	2.79	3.06	3.12	3.35	3.42	3.44	3.45	3.63	3.16	2.65							
2005	100.00	2.69	2.92	2.96	3.14	3.16	3.14	3.09	3.13	2.65	2.14	1.64						
2006	100.89	2.54	2.73	2.75	2.88	2.88	2.81	2.72	2.68	2.21	1.72	1.27	0.89					
2007	102.46	2.46	2.63	2.64	2.75	2.73	2.66	2.55	2.49	2.08	1.68	1.36	1.22	1.55				
2008	103.10	2.33	2.48	2.47	2.56	2.52	2.43	2.31	2.22	1.84	1.47	1.18	1.02	1.09	0.63			
2009	106.13	2.37	2.51	2.51	2.59	2.55	2.48	2.38	2.31	1.99	1.71	1.53	1.50	1.70	1.78	2.93		
2010	109.41	2.41	2.55	2.55	2.63	2.60	2.53	2.45	2.40	2.13	1.91	1.79	1.82	2.05	2.21	3.02	3.10	
2011	110.17	2.31	2.43	2.42	2.49	2.45	2.38	2.29	2.22	1.97	1.76	1.63	1.63	1.77	1.83	2.23	1.89	0.69

1.5 Appendix 1.1

Nordhaus demonstrates how the growth rates in productivity in n sectors of the economy can be aggregated to the growth rate in total-economy productivity.[18] Monaco adopts the formulation to aggregate the growth rates in productivity in the nonfarm business, farm, and "all other" sectors.[19] Equation A1 is a similar adaptation to five sectors: nonfarm business (n), farm (f), households (h), nonprofit institutions (i), and general government (g).

$$
(A1) \quad \dot{P}_t = \dot{P}_n \, wt_n^Q + \dot{P}_f \, wt_f^Q + \dot{P}_h \, wt_h^Q + \dot{P}_i \, wt_i^Q + \dot{P}_g \, wt_g^Q +
$$

$$
\dot{H}_n (wt_n^Q - wt_n^H) + \dot{H}_f (wt_f^Q - wt_f^H) + \dot{H}_h (wt_h^Q - wt_h^H) +
$$

$$
\dot{H}_i (wt_i^Q - wt_i^H) + \dot{H}_g (wt_g^Q - wt_g^H)
$$

Where,

$\dot{X}$	=	rate of change in x
P	=	productivity
H	=	hours worked
wt^Q_f	=	nominal output weight for farm sector defined as the ratio of nominal GDP in the farm sector to nominal GDP for the total economy
wt^H_f	=	hours worked weight for farm sector defined as the ratio of hours worked in the farm sector to hours worked in the total economy
t	=	total economy

In the long-range, it is reasonable to assume that the growth rate in hours worked in all sectors will be equal. Thus, Equation A1 can be simplified to A2.

$$
(A2) \quad \dot{P}_t = \dot{P}_n \, wt_n^Q + \dot{P}_f \, wt_f^Q + \dot{P}_h \, wt_h^Q + \dot{P}_i \, wt_i^Q + \dot{P}_g \, wt_g^Q
$$

Furthermore, if the ultimate long-range growth rates in productivity in the household, nonprofits, and general government sectors are zero, Equation A2 can be further simplified to A3.

$$
(A3) \quad \dot{P}_t = \dot{P}_n \, wt_n^Q + \dot{P}_f \, wt_f^Q
$$

---

[18] Nordhaus, William D., "Productivity Growth and the New Economy." Brookings Papers on Economic Activity, (Volume 2, 2002). pp.211-265

[19] Monaco, Ralph, "Issues in Projecting Productivity in the Very Long Term." Sept. 28, 2005. Treasury Office of Economic Policy. Unpublished.

2. PRICE INFLATION

THE 2013 TRUSTEES REPORT

OFFICE OF THE CHIEF ACTUARY, SOCIAL SECURITY ADMINISTRATION

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2.1 Summary

For the 2013 Trustees Report, the Trustees set the assumed ultimate annual rates of increase in the CPI-W to 1.8 percent, 2.8 percent, and 3.8 percent for alternatives I, II, and III, respectively, as shown in Table 2.1. The Trustees also set the ultimate annual rates of increase in the gross domestic product implicit price deflator (PGDP) to 1.5 percent, 2.4 percent, and 3.3 percent for alternatives I, II, and III, respectively. Thus, the Trustees set the ultimate price differential, defined as the PGDP less CPI-W average annual rates of increase, to -0.3, -0.4, -0.5 percentage point for alternatives I, II, and III, respectively.[20] These values are unchanged from the ones assumed by the Trustees for the 2012 Report.

Table 2.1: Assumed Ultimate Annual Rates of Increase in Inflation Measures

	2013 Trustees Report Alternative			2012 Trustees Report Alternative			2013 Trustees Report Less 2012 Trustees Report		
	I	II	III	I	II	III	I	II	III
CPI-W	1.8	2.8	3.8	1.8	2.8	3.8	0.0	0.0	0.0
PGDP	1.5	2.4	3.3	1.5	2.4	3.3	0.0	0.0	0.0
Price Differential (PGDP less CPI-W)	-0.3	-0.4	-0.5	-0.3	-0.4	-0.5	0.0	0.0	0.0

2.2 Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W)

2.2.1 Historical Growth in the Adjusted CPI-W[21]

Over the last fifty years (1961 to 2011), the adjusted CPI-W grew at an average annual rate of 3.7 percent, or about 0.9 percentage point higher than the assumed ultimate rate of increase of 2.8 percent in the 2012 Trustees Report alternative II. Splitting this period into five decades, the CPI-W grew at average annual rates of 2.6, 7.5, 3.8, 2.3, and 2.5 percent over the 1961-71, 1971-81, 1981-91, 1991-2001, and 2001-11 periods, respectively. Over the last five complete economic cycles (1966 to 2007), the adjusted CPI-W grew at an average annual rate of 4.2 percent. The growth rates by cycle were 4.0, 7.6, 5.0, 2.6, and 2.6 percent for the 1966-73, 1973-

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[20] The projected price differential is important because it affects the rate of increase in the average real OASDI covered wage (see Section 3.3.2.4) and, therefore, the long-range actuarial balance. Holding other factors constant, if the ultimate price differential is moved from -0.4 to -0.5 percentage point, then the long-range rate of increase in the average real OASDI covered wage will decrease by 0.1 percentage point, which in turn, based on the 2012 Trustees Report sensitivity analysis, will lower the long-range actuarial balance by about 0.14 percentage point.

[21] See section 2.2.4 for a description of the adjusted CPI-W.

79, 1979-89, 1989-2000, and 2000-07 periods, respectively. The relatively higher inflation rates experienced from the mid-1960s to the mid-1980s can be reasonably attributed to high capacity utilization associated with the Vietnam War, the two oil price shocks in the early and late 1970s, and the fiscal and monetary policy responses to those events.

After 1981, various factors contributed to the slowdown in the inflation rate. Oil prices were mostly stable between 1980 and 2001, and the dependence of the US economy on oil has decreased since the 1970s. Economic output of developing nations with relatively low labor costs (for example, China and India) increased substantially, as did the share of US imports from those countries. The dollar increased relative to the trade-weighted average of other currencies between 1980 and 1985 and again between 1995 and 2002, further contributing to decreases in prices of imported goods. Although some of those factors have reversed in the last decades (in particular, the price of oil and other commodities increased sharply and the exchange rate of the dollar plummeted between 2002 and 2008), there was little corresponding increase in the inflation rate.[22] This fact may point to the importance of monetary policy as the key factor of price inflation. Since 1979, the monetary policy of the Federal Reserve has been explicitly and consistently geared toward price stability.

2.2.2 Future Growth in the CPI-W

If only past inflation rates were used to determine the assumed ultimate rate for the future, then only the period (e.g., the most recent 50 or 20 years) and method (e.g., a simple, weighted or geometric average) would need to be chosen. The best historical period would be the one that is most representative of the conditions that are expected to prevail over the upcoming 75-year projection period. The 50-year historical record is filled with inflation-related events, some of which occurred in unique circumstances and have limited relevance for projecting the future. These may include the Vietnam War, oil price shocks, and periods of price controls. Furthermore, after a historically unusual departure in the 1970s, monetary policy has returned to a strong emphasis on price stability.

While these specific historical events will not recur in the future (at least not exactly as they have in the past), other inflation-related events may take their place. OCACT believes the average annual rate of increase in the CPI for medical services will continue to grow faster than the CPI for other consumer goods and services. OCACT also believes the effect of this trend on the overall CPI growth rate will be more pronounced in the future because the ratio of health expenditures to total consumer expenditures will rise.[23] It is also reasonable to expect some additional upward pressure on the future growth rate in the CPI due to changes in international trade. The ratio of net exports (i.e., exports less imports) to GDP averaged about -4.5 percent over the 10-year period from 2002 to 2011. Part of this imbalance is due to imports of relatively

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[22] CPI-W grew at a 3.1 percent annual rate over those 6 years, compared to 2.2 percent over the preceding 10 years.
[23] The Boards of Trustees for the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds assume that the average annual rate of increase in total health expenditures over the next 75 years will continue to exceed the growth rate in GDP. See http://www.cms.hhs.gov/ReportsTrustFunds/downloads/tr2012.pdf, pp. 13–20.

low-priced consumer goods from emerging markets, such as China. However, as these developing economies mature, their average wage and consumption are expected to rise relative to their output, and their currencies and price levels are expected to rise relative to those of the U.S. OCACT believes this may put further upward pressure on the prices of basic commodities and, therefore, the CPI. These trends are also expected to ultimately return the ratio of net exports to GDP to zero in the future.

OCACT believes that the 3.7 percent average annual growth rate for the adjusted CPI-W for the 50-year period from 1961 to 2011 is somewhat above the most reasonable assumption for the ultimate CPI-W annual rate of increase. OCACT also believes that the 2.6 percent average annual growth rate for the adjusted CPI-W over the last two complete economic cycles (as measured over an 18-year period from 1989 to 2007) will not be sustainable indefinitely.[24] Since this period reflects the current domestic monetary policy environment expected to exist in the future, somewhat greater weight is placed on more recent experience. Thus, the Trustees set the assumed ultimate rate of increase in the CPI-W to 2.8 percent for the 2013 Trustees Report alternative II, and to 1.8 and 3.8 percent for alternatives I and III, respectively. These values are the same as the ones set by the Trustees for the 2012 Report.

2.2.3 Recent and Expected BLS Changes to the CPI

The Bureau of Labor Statistics (BLS) collects and publishes data on the CPI. BLS updated the consumption expenditure weights in the CPI-W and in the CPI for all Urban Consumers (CPI-U) from the 2007-2008 to 2009-2010 period, effective January 2012.[25] Since 2000, BLS has been updating the weights every two years, and plans to continue on that schedule, instead of the pre-2000 historical average of about once per decade. BLS believes that more frequent updates of the consumption-expenditure weights will have little or no effect on the average future growth rate in the CPI over long periods.[26] Recent data support this view for relatively short periods. When BLS switched from using 1999-2000 to 2001-2002 weights beginning in January 2004, it published monthly values for the CPI-W (and CPI-U) for January through June 2004 based on the 1999-2000 expenditure weights.[27] The values in June 2004 for the CPI-W (and CPI-U) based on the old and new weights were identical. However, the data may also vary over short periods. When BLS switched from using 2001-2002 to 2003-2004 weights beginning in January 2006, it published monthly values for the CPI-W (and CPI-U) for January through June 2006 based on

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[24] Peaks in economic cycles roughly follow the NBER cycle dating, except for short recoveries such as 1980-81, which are not counted as separate cycles.

[25] *News Release for Consumer Price Index, January 2012*, BLS, p. 7
http://stats.bls.gov/news.release/archives/cpi_02172012.pdf

[26] *Future Schedule for Expenditure Weight Updates in the Consumer Price Index*, BLS,
http://stats.bls.gov/cpi/cpiupdt.htm

[27] *News Release for Consumer Price Index, January through June 2004*, BLS, Table 1(OW) and Table 2(OW), http://stats.bls.gov/schedule/archives/cpi_nr.htm

the 2001-2002 expenditure weights.[28] The data indicate that the growth rate in the CPI-W (and CPI-U) over this period was about 0.2 percentage point lower using the newer weights.[29]

2.2.4   OCACT Adjustments to the Published CPI-W

Over the years, BLS has introduced numerous improvements to the CPI-W. For example, beginning in January 1995 and July 1996, BLS introduced changes to correct methodological errors introduced into the index in January 1978 and January 1987. And, beginning in January 1999, BLS introduced a new geometric mean formula that assumes some lower-level substitution among items purchased by consumers within broad categories of goods and services due to changes in relative prices.

Since BLS has no plans to revise the historical CPI, these improvements present a comparability problem. The goal is to project future growth rates in the CPI, based, in part, on an analysis of historical growth rates. Any projected growth rate in the CPI will be affected by the BLS corrections mentioned above. Thus, OCACT adjusted the historical CPI to reflect the estimated effects of these corrections, effectively reducing the measured growth rate in the CPI-W over the historical period. This adjustment is the same as in last year's Trustees Report. Table 2.3 lists the adjusted CPI-W. (See Appendix 2.1 for details on OCACT's adjustments to the actual published CPI-W annual growth rates.)

2.3   Price Differential

The Bureau of Economic Analysis (BEA) publishes values for the PGDP in its National Income and Product Accounts (NIPA). The price differential is defined as the annual growth rate in the PGDP less the annual growth rate in the CPI-W. The price differential is mostly due to differences in computational methods and, to a lesser degree, coverage differences between the CPI-W and the PGDP. The Trustees set the ultimate price differential to -0.4 percentage point, which is equal to the sum of -0.3 percentage point due to the difference in computational methods and -0.1 percentage point due to coverage differences.

Over the 10-year complete economic cycle from 1979 to 1989, the average annual growth rates in the PGDP and the adjusted CPI-W were 4.73 and 5.02 percent, respectively, resulting in a price differential of -0.28 percentage point (i.e., approximately 4.73 less 5.02). Over the next complete economic cycle, an 11-year period from 1989 to 2000, the average annual growth rates in the PGDP and the adjusted CPI-W were 2.23 and 2.63 percent, respectively, resulting in a price differential of -0.39 percentage point (i.e., approximately 2.23 less 2.63).

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[28] *News Release for Consumer Price Index, January through June 2006*, BLS, Table 1(OW) and Table 2(OW), http://stats.bls.gov/schedule/archives/cpi_nr.htm

[29] This was partly due to the fact that, compared to the old 2001-2002 weight, the new 2003-2004 weight for gasoline fell by about 0.2 percentage point while the price of gasoline rose by about 25.0 percent from January to June 2006.

Over the latest complete economic cycle, a 7-year period from 2000 to 2007, the price differential averaged only -0.04 percentage point. It is reasonable to believe this experience was an aberration due to highly unusual price changes in areas where coverage is different between the CPI-W and the PGDP. As explained below, the causes for this peculiar circumstance are not sustainable and have already begun to reverse. For example, the average annual price differential over the 4-year period from 2007 to 2011 was -0.60 percentage point.

2.3.1   Computational Methods for Price Measures[30]

Prior to August 2002, BLS announced that it would produce an additional monthly price index based on the CPI-U using an alternative chained formula for combining prices across broad categories of goods and services.[31] This measure (C-CPI-U) is designed to reflect changes in the distribution of consumer expenditures across these broad groups as they occur during each month. The CPI-U (as well as the CPI-W) reflects a static distribution of consumer expenditures on a monthly basis, adjusting the static distribution every 2 years. BLS simulated a C-CPI-U for the 1990 to 1995 period and estimated that the average annual growth rate in the C-CPI-U would have been 0.15 percentage point lower than the actual published CPI-U for the period. Based in part on this value, the Trustees assumed a 0.2 percentage point difference in the future ultimate average annual growth rates for the PGDP and CPI-W (i.e., a -0.2 price differential) in the 2000, 2001, and 2002 Trustees Reports.

In August 2002, BLS began publishing monthly values for the C-CPI-U. BLS also improved and extended its simulation of the C-CPI-U and estimated that the average annual growth rate in the C-CPI-U would have been lower by 0.22 (instead of 0.15) percentage point over the 1990 to 1995 period, 0.43 percentage point over the 1996 to 1999 period, and 0.30 percentage point over the combined 1990 to 1999 period.[32] Based in part on these higher values, the Trustees increased the assumed difference in the future ultimate average annual growth rates for the PGDP and CPI-W from 0.2 to 0.3 percentage point (i.e., a change from a -0.2 to -0.3 price differential) for the 2003, 2004, and 2005 Trustees Reports.

Actual *final* monthly values for the C-CPI-U are now available back to December 1999.[33] One can directly calculate the difference between the static and chained computational methods for

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[30] By convention, the computational effect and price differential are expressed in positive and negative terms, respectively. For example, a computational effect of 0.3 percentage point will, by itself, contribute -0.3 percentage point to the price differential.

[31] *Note on a New, Supplemental Index of Consumer Price Change*, BLS, http://stats.bls.gov/cpi/cpisuptn.htm

[32]*Simulated CPI-U compared to simulated C-CPI-U: U.S. city average, All-items, December indexes relative to previous December*, BLS, http://stats.bls.gov/cpi/superchart2.htm

[33] Because the C-CPI-U is dependent upon expenditure data that lag the CPI release date, BLS publishes initial, interim, and final monthly values for each calendar year. As of October 2012, final values were only available through December 2010.

the latest periods as the CPI-U less C-CPI-U annual growth rates. The average annual difference over the period from December 1999 to December 2010 was 0.30, and the differences for the 12-month periods ending each December ranged from -0.1 to 0.8 percentage points. In 9 out of the 11 years, the difference was between 0.1 and 0.5 percentage points.

It is reasonable to believe that some of the difference between these computational methods in the more recent period may have been due to unique circumstances associated with price volatility in particular items such as energy, and thus that the difference between these two computational methods may be lower in the future. However, for the post-1999 period, the average annual difference using the *all items less food and energy* expenditure category for the C-CPI-U and CPI-U was 0.33 percent, or approximately equal to the value for the *all items* category.[34]

Summarizing the BLS data, the difference in growth in the CPI-U and the C-CPI-U was about 0.3 percentage point over the 1990 to 1999 period and about 0.3 percentage point over the period from December 1999 to December 2010. This suggests that the difference in measured growth in prices in the CPI-U and the C-CPI-U is likely to average about 0.3 percentage point.

2.3.2   Coverage Differences

The CPI-W covers the consumption pattern for roughly 32 percent of the U.S. population.[35] The PGDP covers the consumption expenditures for the entire population, along with investment and government expenditures.[36] In fact, the PGDP can be viewed as a weighted average of deflators for its principal components: personal consumption expenditures (PGDP_C), gross private domestic investment (PGDP_I), and government consumption expenditures and gross investment (PGDP_G).

Table 2.2, below, shows the contribution to the price differential over varying historical periods due to including the PGDP_I and the PGDP_G in the PGDP. The contribution of the PGDP_I to the price differential is defined as the product of its growth rate differential (defined as PGDP_I less PGDP_C) and its GDP weight (defined as the ratio of nominal investment expenditures to nominal GDP). The contribution of the PGDP_G to the price differential is defined similarly. Columns (a) and (b) list the growth rate differentials for PGDP_I and PGDP_G, while columns

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[34] Using the *all items less food and energy* expenditure category for the C-CPI-U and CPI-U, the difference between the static and the chained computational methods was 0.7 percentage point in 2000 (compared to 0.8 using the *all items* category). For subsequent years, the difference was 0.6 (0.3), 0.3 (0.4), 0.4 (0.2), -0.1 (0.1), 0.3 (0.5), 0.4 (0.3), 0.5 (0.4), 0.0 (-0.1), 0.3 (0.3), and 0.2 (0.2) percentage point for 12-month periods ending in December 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, and 2010, respectively.

[35] *Overview of the CPI*, BLS. http://stats.bls.gov/cpi/cpifaq.htm#Question_1

[36] The PGDP also incorporates the effect of price changes in exports less the effect of price changes in imports. The net effect of these price changes over the historical period has been relatively small. For the long-range future, OCACT assumes net exports (i.e., exports minus imports) will be zero along with their effect on the total PGDP.

(c) and (d) list the separate contributions to the price differential due to PGDP_I and PGDP_G. Column (e) lists the sum of the contributions to the price differential due to the PGDP_I and PGDP_G. Finally, the table includes the Trustees' assumed ultimate values for the growth rate differentials, the weighted differentials, and the sum of the weighted differentials. (See section 2.4.1 for a detailed development of these assumptions.)

The growth rate differentials for PGDP_I were -1.69 and -1.92 percent over the 1979 to 1989 and 1989 to 2000 economic cycles, respectively. When weighted, these growth rate differentials contributed -0.29 and -0.30 percentage point to the overall price differential for the periods. The Trustees set the future assumed growth rate differential for PGDP_I to -1.29. When weighted, this will contribute about -0.20 to the overall price differential. The assumed future contribution to the price differential is about two-thirds (i.e., -0.20 / -0.30) of its historical contribution over the 1979 to 2000 period, due mostly to OCACT's assumption that the price of computers and software will not fall as steeply in the long-range future compared to the post-1979 historical period. The 7-year period from 2000 to 2007 was discounted on the belief that the behavior of the PGDP_I during this period was an aberration. The growth rate differential for PGDP_I turned positive during this period due to the relatively rapid growth in the investment deflators for residential and nonresidential structures. OCACT believes this behavior is not sustainable into the near future. In fact, the growth rate differential for PGDP_I turned back to an average annual value of -1.88 percent for the 4-year period from 2007 to 2011, reflecting, in part, actual declines in the price of new housing in most markets during the period.

Table 2.2: Estimated Contribution to the Price Differential

Range	Differences in Deflator Growth Rates				
	Unweighted		Weighted (Contribution to the Price Differential)		
	PGDP_I less PGDP_C	PGDP_G less PGDP_C	PGDP_I	PGDP_G	PGDP_I And PGDP_G
			(a) * weight	(b) * weight	(c + d)
	(a)	(b)	(c)	(d)	(e)
Econ. Cycles					
1979-1989	-1.69	-0.11	-0.29	-0.02	-0.31
1989-2000	-1.92	0.37	-0.30	0.07	-0.23
2000-2007	0.04	1.85	0.01	0.34	0.35
Latest					
2007-2011	-1.88	0.58	-0.25	0.12	-0.13
Assumed Values	-1.26	0.65	-0.20	0.12	-0.08

The growth rate differentials for PGDP_G were -0.11 and 0.37 percent over the 1979 to 1989 and 1989 to 2000 economic cycles, respectively. When weighted, these growth rate differentials contributed -0.02 and 0.07 percentage point to the overall price differential for those periods. The Trustees set the future assumed growth rate differential for PGDP_G to 0.67, which when weighted will contribute about 0.12 to the overall price differential. The assumed future

contribution to the price differential is about 0.10 higher (i.e., 0.12 – 0.02) than its historical contribution over the 1978 to 2000 period. OCACT believes the PGDP_G contribution to the price differential during this historical period was temporarily depressed due to a relative increase in lower-paid state and local government workers. OCACT also believes the PGDP_G contribution to the price differential during the 7-year period from 2000 to 2007 was high because the growth rate in average military compensation averaged 9.2 percent over the period. OCACT believes this relatively high growth rate was due to temporary factors. Federal payments for basic military pay, reenlistment bonuses, and other types of incentive pay increased sharply after the 9/11 terrorist attacks. Furthermore, beginning in 2002, the BEA redefined military compensation to include federal payments to the Uniformed Services Retiree Healthcare Fund. In the future, OCACT believes that the annual growth rate in average military compensation will slow and follow the assumed ultimate 4.1 percent average annual growth rate in compensation for all workers.

Thus, the Trustees set the future contribution to the price differential due to the PGDP_I and the PGDP_G to -0.1 percentage point. This is approximately equal to the sum of a -0.20 percentage point price differential due to the PGDP_I and 0.12 percentage point due to the PGDP_G. The assumed future combined contribution of -0.1 percentage point is smaller (less negative) than the actual historical combined contribution to the price differential of -0.27 percentage point over the 1979 to 2000 period.

2.3.3   Future Expectations for the Price Differential

For the 2013 Trustees Report, the Trustees set the assumed ultimate price differential to -0.3, -0.4, and -0.5 percentage point for alternative I, II, and III, respectively. For the alternative II, the ultimate price differential of -0.4 percentage point is the sum of -0.3 percentage point due to the difference in computational methods and -0.1 percentage point due to coverage differences between the PGDP and CPI-W. These values are unchanged from the ones assumed by the Trustees for the 2012 Report.

2.4   Gross Domestic Product Implicit Price Deflator (PGDP)

2.4.1   Historical Behavior of the Adjusted PGDP

As mentioned in section 2.3.2, for the future, the PGDP can be viewed as a weighted average of the PGDP_C, PGDP_I, and PGDP_G. The weights are the ratios of the components' nominal expenditures to total nominal GDP. In 2011, the weights for personal consumption, investment, and government expenditures were about 0.71, 0.12, and 0.20, respectively. These weights summed to more than one because net exports were negative. However, over the 50-year period from 1961 to 2011, the weights for personal consumption, investment, and government expenditures were approximately 0.65, 0.16, and 0.20, respectively, and summed to about 1.0. The long-run assumption is that net exports will be zero and the weights will sum to 1.0.

Because these weights have been relatively stable over the last four decades (and have summed to about 1.0), the long-run historical growth rate in PGDP is mostly explained by the separate

historical growth rates in PGDP_C, PGDP_I, and PGDP_G. The historical and expected future growth rates for each component deflator are examined below.

It should be noted that the PGDP (and each of its major components— PGDP_C, PGDP_I, and PGDP_G) are combined using a chain-weighted computational method. Thus, when computing a price differential between the PGDP (or any of its major components) and the CPI-W, the historical and expected future difference between the CPI-U and the chain-weighted C-CPI-U of -0.30 percentage point applies similarly to the expected price differential between the PGDP and the CPI-W for the future.

2.4.1.1 Adjusted Deflator for Personal Consumption Expenditures (PGDP_C)

Given all of the changes to the CPI and PGDP over time, it seems reasonable to expect that the more recent decades best depict the future relationship between the two price measures; more specifically, only the post-1977 period when the adjusted CPI-W incorporates most of the improvements in the CPI as presently defined. Over the 32-year period from 1979 to 2011, the average annual growth rates for the adjusted PGDP_C and adjusted CPI-W were 3.15 and 3.32 percent, respectively. Hence, the difference between these average annual growth rates over this period was about -0.17 percentage point (i.e., 3.15 − 3.32).

This -0.17 percentage point observed difference over the 1979 to 2011 period is smaller than the -0.30 percentage point expected future difference (consistent with the estimated 0.30 percentage point difference due to the computational methods used for weighting broad groups of goods and services), in part, because the populations covered by the two price measures are different. As mentioned in Section 2.3.2, the CPI-W covers the consumption pattern for roughly 32 percent of the population, while the PGDP_C covers personal consumption expenditures for the total population. The CPI-U, on the other hand, covers about 87 percent of the population. Over the 1979 to 2011 period, the CPI-U grew faster than the CPI-W by about 0.07 percentage point per year, mostly because the former had relatively larger weights for medical and college expenditures—two areas where prices had been rising faster than for other goods. If the CPI-W had the same expenditure weights as the CPI-U, then the adjusted CPI-W would have grown at an annual rate of roughly 0.07 percentage point faster than it did. This would have resulted in an observed difference (adjusted PGDP_C less adjusted CPI-W growth rates) of -0.24 (i.e., -0.17 − 0.07) percentage point, closer to the -0.30 percentage point expected difference due to computational methods alone.

The most recently revised BLS and BEA data for 2000 and later also support a 0.30 percentage point effect for the different computational methods (adjusted PGDP_C less adjusted CPI-W growth rates). As mentioned in Section 2.3.1, BLS has published initial, interim, and final monthly values for the C-CPI-U for each year beginning January 2000. Final values are now available for 2010. The average annual growth rate in the C-CPI-U from the first quarter of 2000 to the fourth quarter of 2010 was 2.09 percent. Over the same period, the average annual growth rates in the PGDP_C, CPI-U, and CPI-W were approximately 2.13, 2.38, and 2.39 percent, respectively. The data suggest that over this period, the contribution of the difference in

computational methods was about 0.29 percentage point (i.e., 2.38 − 2.09), and that the PGDP_C price differential was -0.26 percentage point (i.e., 2.13 − 2.39).[37]

Over the long-range period, it is reasonable to assume that the average annual growth rates in the CPI-W and CPI-U will be roughly equal. It also seems reasonable to assume that the difference in the long-range average annual growth rates (PGDP_C less CPI-W) will be -0.30 percentage point, and that this difference will be only due to the expected 0.30 percentage point effect from the different computational weighting methods. Stated differently, the expected growth-rate differential for the personal consumption deflator (PGDP_C less CPI-W) due to factors other than from the computational weighting methods is assumed to be zero. Thus, the Trustees set the assumed ultimate annual growth rate for PGDP_C to 2.5 percent, or equal to the assumed ultimate annual growth rate for CPI-W (i.e., 2.8 percent) less the 0.30 percentage point effect of the different computational weighting methods.

2.4.1.2   Deflator for Investment Expenditures (PGDP_I)

The PGDP_I can be viewed as a weighted average of deflators for its principal components: investment in nonresidential equipment and software (PGDP_INE), residential investment (PGDP_IR), and investment in nonresidential structures (PGDP_INS).[38] Based on new analysis, the Trustees set some changes in assumptions for price changes and weights for those components, but those changes largely offset each other and the resulting assumption for the price differential is unchanged.

Deflator for Equipment and Software (PGDP_INE) – Over the 32-year period from 1979 to 2011, the average annual growth rate was about 0.03 percent for the PGDP_INE, compared to 3.15 percent for the PGDP_C. The PGDP_INE growth rate has been depressed by two well-documented trends: the sharp decline in quality-adjusted prices for computers and software and the rapid rise in nominal investment expenditures for those two products. Over this period, the deflators for computers and software fell at an average annual rate of about 13.6 and 1.1 percent, respectively. Also over this period, the ratio of nominal investment expenditures for computers to all investment expenditures for equipment and software rose from about 4 percent to about 11 percent in the late 1990s, followed by a decline to about 7 percent, while the ratio of nominal investment expenditures for software rose fairly steadily from about 4 percent to about 26 percent.

It seems reasonable to assume that quality-adjusted computer prices will continue to decline into the future, but at a somewhat slower rate. The average annual rate of decline was about 12.9 percent over the 1982 to 1994 period, 22.2 percent over the 1994 to 1999 period, and 10.2

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[37] The data also suggest that over the period the average annual growth rate in the C-CPI-U (2.09 percent) was a reasonable approximation of the average annual growth rate in the PGDP_C (2.13 percent), and that the average annual growth rates in the CPI-U (2.38 percent) and CPI-W (2.39 percent) were approximately equal over the period, compared to the 0.08 average annual percentage point differential over the 1978-2011 period.

[38] This decomposition excludes the change in business inventories, which has averaged roughly 2.0 percent of total investment expenditures over the 33-year period from 1978 to 2011.

percent over the 1999 to 2011 period. The large rate of decline in the late 1990s was probably due to a combination of technological advances and production volume increases that are unlikely to be sustained over a longer period. It seems more reasonable to assume that the future rate of price decline will be similar to that over the last 12 years; thus, the Trustees assume a rate of decline of quality-adjusted computer prices of 10 percent per year. Furthermore, it is expected that the ratio of nominal investment expenditures for computers to all investment expenditures for equipment and software will stabilize at the approximate average value of the ratio over the last decade (i.e., 8 percent).[39]

Software prices have been declining slowly, but steadily. They declined over four of the last five economic cycles (the only exception being the 1973-79 cycle), and their rate of decline averaged between 0 and 1 percent per year over three of those four cycles. (The rate of decline over the 1989-2000 cycle was 1.9 percent per year.) The price level in 2011 was about the same as in 2004. It seems reasonable to expect some future price decline, but at a somewhat slower rate than the average over the last 30 years. The Trustees assume that software prices will decline at a rate of 0.5 percent per year. OCACT also expects that the ratio of nominal investment expenditures for software to all investment expenditures for equipment and software will stabilize at about 27 percent.[40]

Besides computers and software, equipment and software expenditures include a residual component for other equipment. Over the last three decades from 1981 to 2011, the deflator for other equipment grew on average at a 1.57 percent annual rate, or 1.15 percent less than the 2.72 percent annual growth rate for the PGDP_C. Similarly, over the last three complete economic cycles (1979-2007), the deflator for other equipment grew slower by 1.14 percent per year than PGDP_C. The difference was somewhat greater in more recent years: 1.52 percent over the last two complete cycles, and 1.48 percent over the last 20 years. OCACT believes that the growth rate in the price deflator for other equipment will continue to be depressed relative to the PGDP_C, since the prices for at least some items in other equipment (e.g., printers, calculators, etc.) will be driven down by the same types of future technological advancements expected for computers. Thus, OCACT believes that it is reasonable to expect that, in the future, the average annual growth rate in other equipment will be about 1.25 percent, or 1.25 percent less than the 2.5 percent assumed ultimate average annual growth rate in the PGDP_C.

Using these average annual growth rates and weights, OCACT believes that it is reasonable to set the assumed ultimate average annual rate of growth in PGDP_INE in the future to about -0.12 percent (i.e., $-10.0 * 0.08 - 0.5 * 0.27 + 1.25 * 0.65$).

Deflator for Residential Investment (PGDP_IR) – Residential investment is almost entirely composed of investment in fixed structures which, in turn, is composed of single-family, multifamily, and other structures (e.g., manufactured homes, dormitories, etc.). Over the 21-year period from 1979 to 2000, the average annual growth rate was about 3.73 percent for the PGDP_IR, compared to 3.67 percent for the PGDP_C. Thus, the average annual growth rate for

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[39] In the 2012 Trustees Report, the assumed rate of decline was 11.9 percent and the ratio was 10 percent.
[40] In the 2012 Trustees report, software prices were assumed not to change and the ratio was 25 percent.

the PGDP_IR was about 0.06 percentage point (3.73 − 3.67) higher than the average annual growth rate in the PGDP_C over the period. However, over the next 7-year period, this differential increased substantially. From 2000 to 2007, the average annual growth rate was about 4.82 percent for the PGDP_IR and 2.33 percent for the PGDP_C. Thus, the average annual growth rate for the PGDP_IR was about 2.49 percentage points (4.82 − 2.33) higher than the average annual growth rate in the PGDP_C over the period.

OCACT believes that the 2.48 percent growth rate differential between the PGDP_IR and the PGDP_C over the last business cycle was a temporary market phenomenon characterized by overheated demand for housing, house "flipping," subprime mortgage lending, and unusually high profits and gains in stock prices for the builders of new homes. Since 2007, there has been a market correction: the subprime mortgage market has collapsed, new and existing home sales have dropped nationally, actual prices of new homes in most markets have declined, and the profits and stock prices of new homebuilders have plummeted. For the 2007 to 2010 period, the average annual growth in PGDP_IR and PGDP_C was -1.6 and 1.7 percent, respectively, indicating a -3.3 percent (-1.6 − 1.7) differential between the two deflators. Although the growth rate of PGDP_IR turned positive again in 2011, at 0.9 percent it was still 1.5 percentage points below the growth rate in PGDP_C (which was 2.4 percent).

OCACT believes it is reasonable to disregard the post-2000 period and set the assumed ultimate average annual rate of increase in the PGDP_IR to 2.6 percent, or about 0.1 percentage point higher than the 2.5 percent assumed ultimate average annual rate of increase in the PGDP_C. [41]

Deflator for Investment in Nonresidential Structures (PGDP_INS) – Investment in nonresidential structures includes amounts for drilling for petroleum and natural gas. Over the 22-year period from 1979 to 2000, the average annual growth rate for PGDP_INS was 3.62 percent, or slightly less than the 3.73 percent growth rate in PGDP_IR. However, over the 7-year period from 2000 to 2007, the average annual growth rates for PGDP_INS and PGDP_IR were 7.48 and 4.82 percent, respectively. The relatively faster average annual growth rate for PGDP_INS occurred because the average annual growth rate in the deflator for investment in petroleum and natural gas was about 20.9 percent. Excluding the effects of petroleum and natural gas, the average annual growth rate for PGDP_INS was about 6.0 percent, much closer to the 4.8 percent average annual growth rate in PGDP_IR over the period.

OCACT believes the relatively rapid growth rate in the deflator for investment in petroleum and natural gas is another temporary market phenomenon associated with a run-up in oil prices. The price of a barrel of oil rose from about $26 in 2001 to $72 in 2007, or at an average annual rate of about 19.0 percent. As the market price for oil rose, previously expensive investment technologies became economically profitable.

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[41] In the future, the PGDP_IR may grow faster than the PGDP_C due to more rapid increases in the prices of scarce land and basic building commodities such as copper, lumber, and cement. In the 2012 Trustees Report, OCACT assumed a 2.8 percent annual rate.

OCACT believes that in the future the average annual growth rate in the price of a barrel of oil will not be significantly greater than the growth rate in the PGDP_C and that the average annual growth rates in the PGDP_INS and PGDP_IR will be approximately equal. Thus, the Trustees set the assumed ultimate average annual rate of increase in PGDP_INS to 2.6 percent, or 0.1 percentage point higher than the 2.5 percent assumed ultimate average annual growth rate in the PGDP_C, and equal to the assumed ultimate average annual rate of increase in the PGDP_IR.

Using rough averages and trends over the last 40 years, OCACT assumes the future ratio of nonresidential investment for equipment and software to total investment expenditures will be 50.0 percent, and the investment expenditure weights for nonresidential investment for structures and residential investment will be 25 percent each. Thus, the Trustees set the assumed ultimate average annual rate of increase for PGDP_I to 1.24 percent (i.e., -0.12 * 0.5 + 2.6 * (0.25 + 0.25)).

Given the assumed ultimate average annual growth rate for the CPI-W of 2.8 percent, the expected future investment price differential is -1.56 percent (i.e., 1.24 – 2.8), which can be viewed as the sum of -0.3 percentage point for the computational weighting method and -1.26 percentage points (i.e., -1.56 – (-0.3)) for the compositional effects of factors such as computers and software. With a weighting of about 16 percent in the overall PGDP, a -1.26 percentage point price differential in PGDP_I (beyond that for computational method) contributes about -0.20 percentage point (0.16 * -1.26) to the overall price differential for PGDP.

2.4.1.3   Deflator for Government Expenditures (PGDP_G)

The PGDP_G can be viewed as a weighted average of deflators for government consumption expenditures (PGDP_GC) and government investment (PGDP_GI). The historical proportions of government consumption and investment expenditures have been relatively stable over the 30-year period from 1981 to 2011, averaging about 83 and 17 percent of total government expenditures, respectively.

<u>Deflator for Government Consumption Expenditures (PGDP_GC)</u> – Government consumption expenditures can be separated into employee compensation and other (residual) government consumption expenditures. In the NIPA, the deflator for government consumption expenditures on employee compensation is defined as average employee compensation. From 1979 to 2000, a 21-year period covering two complete economic cycles, the average annual growth rate in the deflator for employee compensation and the adjusted CPI-W were about 5.16 and 3.76 percent, respectively. This indicates that over the period, the real annual growth rate in average employee compensation was 1.4 percent (i.e., 5.16 – 3.76), slightly higher than the assumed ultimate real annual growth rate in average compensation in the 2012 Trustees Report.[42]

From 2000 to 2007, a 7-year period covering the latest economic cycle, the average annual growth rate in the deflator for employee compensation and the adjusted CPI-W were about 5.08

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[42] For the 2012 Trustees Report alternative II, the Trustees assumed that the ultimate average annual rates of increase in the average compensation for all employees and in the CPI were 4.07 and 2.8 percent, respectively.

and 2.64 percent, respectively. This indicates that over the period, the real annual growth rate in average government compensation was 2.44 percent (i.e., 5.08 − 2.64), or almost twice the 1.23 percent ultimate real annual growth rate in average compensation assumed in the 2012 Trustees Report.

OCACT believes that the relatively high growth rate in the deflator for employee compensation over the 2000 to 2007 period is a temporary phenomenon mostly associated with military pay incentives for the conflicts in Iraq and Afghanistan. Over this period, the average annual growth rates in the average compensation of state and local, federal civilian, and federal military employees were 4.37, 6.22, and 9.16 percent, respectively. By contrast, between 2007 and 2011, the average annual growth rates in the average compensation of state and local, federal civilian, and federal military employees were 2.59, 2.49, and 4.67 percent, respectively, and the average annual growth rate in the deflator for employee compensation was 3.12 percent, or just 0.88 percentage points higher than the 2.24 percent growth rate in CPI-W over the same period. It is reasonable to assume that in the future the average annual growth rate in the average compensation for all government employees will be 4.07 percent, the same rate assumed for the economy-wide average compensation. Therefore, OCACT believes that the average annual growth rate in the deflator for government consumption expenditures on employee compensation will be 4.07 percent.

It is also reasonable and consistent to assume that the average annual growth rate in the deflator for other government consumption will be equal to the assumed ultimate average annual growth rate in the PGDP_C. Hence, OCACT assumes that the average annual growth rate in the deflator for other government consumption will be 2.5 percent, or equal to the assumed ultimate average annual growth rate in the PGDP_C.

Using rough averages over the 1978 to 2011 period, OCACT assumes that future government consumption expenditures for employee compensation will be about 63.0 percent of total government consumption expenditures. Thus, the Trustees set the assumed ultimate average annual growth rate for PGDP_GC to 3.49 percent (i.e., 4.07 * 0.63 + 2.5 * 0.37).

Deflator for Government Investment (PGDP_GI) – Government investment can be separated into 1) structures and 2) equipment and software. It is reasonable to assume that the future average annual growth rate in the deflator for government investment for structures will be 2.6 percent, or equal to the expected future average annual growth rate in private investment in nonresidential structures (PGDP_INS). Similarly, OCACT also assumes the future average annual growth rate in the deflator for government investment in equipment and software will be -0.12 percent, or equal to the expected future average annual growth rate in PGDP_INE.

Using rough averages over the 1979 to 2010 period, OCACT assumes the future ratio of government investment for structures to total government investment will be about 0.60. Thus, the Trustees set the assumed ultimate average annual growth rate for PGDP_GI to 1.51 percent (i.e., 2.6 * 0.60 − 0.12 * 0.40).

The Trustees also set the assumed ultimate average annual rate of increase in the PGDP_G to 3.15 percent (i.e., 3.49 * 0.83 + 1.51 * 0.17). Given the assumed ultimate average annual growth rate for the CPI-W of 2.8 percent, the expected future government price differential is 0.35 percent (i.e., 3.15 − 2.8), which can be viewed as the sum of -0.3 for the CPI computational method and 0.65 (i.e., 0.35 – (-0.3)) for the compositional effects of factors such as compensation, computers, and software. With a weighting of about 18.0 percent in the overall PGDP, a 0.65 percentage point price differential in PGDP_G (beyond that for computational method) contributes about 0.12 percentage point (0.18 * 0.65) to the overall price differential for PGDP.

2.4.2 Future Expectations for Aggregate PGDP Growth Rate and Price Differential (PGDP Growth Rate Less the CPI-W Growth Rate)

OCACT believes it is reasonable to set the assumed ultimate aggregate price differential to -0.4 percentage point. This aggregate value is the sum of the -0.3 percentage point for the difference in computational weighting methods and an additional -0.1 percentage point coverage differential which, in turn, is the approximate sum of a -0.20 percentage point coverage differential due to the PGDP_I and a 0.12 percentage point coverage differential due to the PGDP_G. Thus, for alternative II, the Trustees set the assumed ultimate average annual rate of increase in the PGDP to 2.4 percent, or equal to the assumed ultimate annual rate of increase in the CPI-W of 2.8 percent plus the assumed ultimate price differential of -0.4 percentage point. For alternative I, the Trustees set the assumed ultimate average annual rate of increase in the PGDP to 1.5, or equal to the ultimate annual rate of increase in the CPI-W of 1.8 percent plus the assumed ultimate price differential of -0.3 percentage point. For alternative III, the Trustees set the assumed ultimate average annual rate of increase in the PGDP to 3.3, or equal to the ultimate annual rate of increase in the CPI-W of 3.8 percent plus the assumed ultimate price differential of -0.5 percentage point.

2.4.3 Recent BEA Changes to PGDP

On July 27, 2012, BEA released an annual revision to the NIPA back to 2009.[43] Compared to the unrevised data, BEA increased the average annual growth rate in the PGDP by about 0.1 percentage point for 2010 and decreased it by about the same amount for 2009.

2.4.4 OCACT Adjustments to the Published PGDP

BEA's estimate of the PGDP is based, in part, on BLS's estimate of the CPI. BLS has introduced numerous improvements to the CPI that have lowered its post-1995 growth rate. BEA "backcasted" these improvements in the NIPA, lowering the growth rate in the PGDP (and raising the growth rate in real GDP). However, because BEA only backcasted these effects to 1978, OCACT has lowered the pre-1978 growth rate in the PGDP for consistency (see Appendix

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[43] "National Income and Product Accounts Gross Domestic Product, 2nd quarter 2012 (advance estimate); Revised Estimates: 2009 through First Quarter 2012" BEA, News Release, July 27, 2012. http://bea.gov/newsreleases/national/gdp/2012/gdp2q12_adv.htm.

2.1 for further details on the adjustments to the actual published PGDP and real GDP annual growth rates). The adjusted PGDP is shown in Table 2.4.

2.5   Projections from Other Forecasters

Global Insight, Inc. includes projections through 2042 in its latest long-run trend forecast (see August 2012 30-year US Macro Trend Projection). Over the 20-year period from 2022 to 2042, Global Insight, Inc. projects an average annual rate of increase of 2.02 percent for the CPI and 1.80 percent for the PGDP, with a resulting price differential of -0.22 percentage point (1.80 − 2.02). Macroeconomic Advisers publishes its latest long-run projections (*Long-Term Economic Outlook*, Third Quarter, 2012) through 2021. Over the 5-year period from 2016 to 2021, it projects an average annual rate of increase of 2.21 percent for the CPI and 1.98 percent for the PGDP, for a price differential of -0.23 percentage point (1.98 − 2.21). The Moody's Analytics' August 2012 forecast extends to 2042. Over the 20-year period from 2022 to 2042, Moody's Analytics projects an average annual growth rate of 1.96 percent for the CPI and 1.76 percent for the PGDP, for a price differential of -0.20 percentage point (1.76 – 1.96).

The Office of Management and Budget (OMB) Mid-Session Review of the Fiscal Year 2013 Budget includes projections through 2090. OMB's annual growth rates for the PGDP and CPI-W (and CPI-U) for the 2017-2090 period were 1.9 and 2.2 percent, respectively. Thus, OMB projects a price differential of -0.3 percentage point (i.e., 1.9 – 2.2). The Congressional Budget Office (CBO) June 2012 report, *The 2012 Long-Term Budget Outlook*, includes projections through 2087. CBO's annual growth rates for the PGDP and CPI-W (and CPI-U) for 2022 were 2.0 and 2.3 percent, respectively. For 2087, the respective growth rates were 2.2 and 2.5 percent. Thus, CBO projects an average annual price differential of -0.3 percentage point for 2022 (i.e., 2.0 − 2.3) and for 2087 (i.e., 2.2 − 2.5). The Social Security Advisory Board's 2011 Technical Panel on Assumptions and Methods recommended assuming an ultimate (i.e., long-range average) annual rate of increase in the Consumer Price Index for Urban Wage Earners and Clerical Workers (CPI-W) of 2.8 percent for alternative II, and a price differential of -0.2 percentage point.

Table 2.3: Adjusted CPI-W: Compound Annual Rates of Growth (%) Base Year = 1982-1984

To	Variable	From 1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
1961	35.41																		
1962	35.69	0.80																	
1963	36.09	0.96	1.12																
1964	36.48	1.00	1.11	1.10															
1965	36.99	1.10	1.21	1.25	1.40														
1966	37.97	1.41	1.56	1.71	2.02	2.64													
1967	39.06	1.65	1.82	2.00	2.30	2.75	2.87												
1968	40.42	1.91	2.10	2.29	2.59	2.99	3.17	3.48											
1969	42.13	2.20	2.40	2.61	2.92	3.30	3.53	3.86	4.24										
1970	44.07	2.46	2.67	2.90	3.20	3.56	3.80	4.11	4.42	4.61									
1971	45.87	2.62	2.83	3.04	3.33	3.65	3.85	4.10	4.31	4.34	4.08								
1972	47.31	2.67	2.86	3.05	3.30	3.58	3.73	3.91	4.01	3.94	3.60	3.13							
1973	50.13	2.94	3.14	3.34	3.59	3.87	4.05	4.25	4.40	4.44	4.39	4.54	5.98						
1974	55.09	3.46	3.68	3.92	4.21	4.52	4.76	5.03	5.30	5.51	5.73	6.29	7.91	9.87					
1975	59.44	3.77	4.00	4.25	4.54	4.86	5.10	5.39	5.66	5.90	6.16	6.69	7.91	8.88	7.90				
1976	62.71	3.88	4.11	4.34	4.62	4.91	5.15	5.40	5.64	5.85	6.05	6.45	7.30	7.75	6.70	5.51			
1977	66.55	4.02	4.24	4.47	4.73	5.02	5.23	5.47	5.70	5.88	6.06	6.40	7.07	7.34	6.51	5.82	6.13		
1978	70.97	4.18	4.39	4.61	4.87	5.14	5.35	5.58	5.79	5.96	6.14	6.43	6.99	7.20	6.54	6.09	6.38	6.63	
1979	77.82	4.47	4.69	4.92	5.18	5.46	5.68	5.91	6.14	6.33	6.52	6.83	7.37	7.60	7.16	6.97	7.46	8.14	9.66
1980	86.39	4.81	5.03	5.27	5.54	5.82	6.05	6.30	6.53	6.75	6.96	7.29	7.82	8.08	7.79	7.77	8.34	9.09	10.33
1981	94.56	5.03	5.26	5.50	5.76	6.04	6.27	6.52	6.76	6.97	7.19	7.50	8.00	8.25	8.03	8.05	8.56	9.18	10.04
1982	100.13	5.08	5.29	5.52	5.77	6.03	6.25	6.48	6.69	6.89	7.08	7.35	7.79	7.99	7.76	7.74	8.11	8.51	8.99
1983	104.31	5.03	5.24	5.45	5.68	5.93	6.12	6.33	6.52	6.69	6.85	7.09	7.45	7.60	7.35	7.28	7.54	7.78	8.01
1984	108.47	4.99	5.18	5.38	5.60	5.83	6.00	6.19	6.36	6.51	6.64	6.84	7.16	7.27	7.01	6.91	7.09	7.23	7.33
1985	112.11	4.92	5.10	5.29	5.49	5.70	5.86	6.03	6.19	6.31	6.42	6.59	6.86	6.94	6.67	6.55	6.67	6.74	6.75
1986	113.84	4.78	4.95	5.12	5.31	5.50	5.64	5.79	5.92	6.02	6.11	6.25	6.47	6.51	6.24	6.09	6.14	6.15	6.09
1987	117.62	4.73	4.89	5.05	5.22	5.40	5.53	5.67	5.78	5.87	5.94	6.06	6.26	6.28	6.01	5.85	5.88	5.86	5.77
1988	121.78	4.68	4.83	4.99	5.15	5.32	5.44	5.56	5.67	5.75	5.81	5.91	6.09	6.10	5.83	5.67	5.69	5.65	5.55
1989	126.99	4.67	4.81	4.96	5.12	5.27	5.39	5.51	5.60	5.67	5.73	5.82	5.98	5.98	5.73	5.57	5.58	5.53	5.43
1990	133.09	4.67	4.81	4.95	5.10	5.25	5.36	5.47	5.57	5.63	5.68	5.77	5.91	5.91	5.67	5.52	5.52	5.48	5.38
1991	137.73	4.63	4.77	4.90	5.04	5.19	5.29	5.39	5.48	5.53	5.58	5.65	5.79	5.77	5.54	5.39	5.39	5.33	5.23
1992	141.08	4.56	4.69	4.81	4.95	5.08	5.18	5.27	5.35	5.39	5.43	5.50	5.62	5.60	5.36	5.22	5.20	5.14	5.03
1993	144.32	4.49	4.61	4.73	4.86	4.98	5.07	5.16	5.22	5.26	5.29	5.35	5.45	5.43	5.20	5.05	5.03	4.96	4.85
1994	147.26	4.41	4.53	4.64	4.76	4.88	4.96	5.04	5.10	5.13	5.15	5.20	5.30	5.26	5.04	4.89	4.86	4.78	4.67
1995	150.88	4.36	4.47	4.57	4.69	4.80	4.87	4.94	5.00	5.03	5.05	5.09	5.17	5.14	4.92	4.77	4.73	4.65	4.54
1996	154.78	4.30	4.41	4.51	4.62	4.73	4.80	4.86	4.91	4.94	4.95	4.98	5.06	5.02	4.81	4.66	4.62	4.54	4.43
1997	158.08	4.24	4.34	4.44	4.54	4.64	4.71	4.77	4.82	4.84	4.84	4.87	4.94	4.90	4.69	4.55	4.50	4.42	4.31
1998	159.93	4.16	4.25	4.35	4.44	4.54	4.60	4.65	4.69	4.71	4.71	4.73	4.80	4.75	4.54	4.40	4.35	4.26	4.15
1999	163.24	4.10	4.19	4.28	4.37	4.46	4.52	4.57	4.61	4.62	4.62	4.64	4.69	4.65	4.44	4.30	4.25	4.16	4.05
2000	168.93	4.09	4.18	4.26	4.35	4.43	4.49	4.54	4.57	4.58	4.58	4.60	4.65	4.60	4.40	4.27	4.22	4.13	4.02
2001	173.46	4.05	4.14	4.22	4.30	4.39	4.44	4.48	4.51	4.52	4.52	4.53	4.58	4.53	4.34	4.21	4.15	4.07	3.96
2002	175.92	3.99	4.07	4.15	4.23	4.30	4.35	4.39	4.42	4.43	4.42	4.43	4.48	4.42	4.23	4.10	4.05	3.96	3.86
2003	179.74	3.94	4.02	4.10	4.17	4.25	4.29	4.33	4.36	4.36	4.35	4.36	4.40	4.35	4.16	4.03	3.98	3.90	3.79
2004	184.51	3.91	3.99	4.06	4.14	4.21	4.25	4.29	4.31	4.31	4.30	4.31	4.35	4.29	4.11	3.98	3.93	3.85	3.74
2005	190.95	3.90	3.98	4.05	4.12	4.19	4.23	4.26	4.29	4.29	4.28	4.28	4.32	4.27	4.09	3.97	3.91	3.84	3.73
2006	197.15	3.89	3.96	4.03	4.10	4.17	4.20	4.24	4.26	4.26	4.25	4.25	4.29	4.24	4.07	3.94	3.89	3.82	3.72
2007	202.79	3.87	3.94	4.00	4.07	4.13	4.17	4.20	4.22	4.22	4.21	4.22	4.25	4.20	4.03	3.91	3.86	3.78	3.69
2008	211.09	3.87	3.94	4.00	4.07	4.13	4.17	4.20	4.22	4.22	4.21	4.21	4.24	4.19	4.03	3.92	3.87	3.79	3.70
2009	209.61	3.77	3.84	3.90	3.96	4.02	4.05	4.08	4.10	4.09	4.08	4.08	4.11	4.05	3.89	3.78	3.72	3.65	3.56
2010	213.97	3.74	3.80	3.86	3.92	3.98	4.01	4.03	4.05	4.04	4.03	4.03	4.05	4.00	3.84	3.73	3.68	3.60	3.51
2011	221.58	3.74	3.80	3.85	3.91	3.97	4.00	4.02	4.04	4.03	4.02	4.02	4.04	3.99	3.83	3.72	3.67	3.60	3.51

Table 2.3 (continued). Adjusted CPI-W: Compound Annual Rates of Growth (%) Base Year = 1982-1984

To	Variable	From 1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1978	70.97																	
1979	77.82	9.66																
1980	86.39	10.33	11.01															
1981	94.56	10.04	10.23	9.46														
1982	100.13	8.99	8.76	7.66	5.89													
1983	104.31	8.01	7.60	6.48	5.03	4.17												
1984	108.47	7.33	6.87	5.86	4.68	4.08	3.99											
1985	112.11	6.75	6.27	5.35	4.35	3.84	3.67	3.36										
1986	113.84	6.09	5.58	4.71	3.78	3.26	2.96	2.45	1.54									
1987	117.62	5.77	5.30	4.51	3.70	3.27	3.05	2.74	2.43	3.32								
1988	121.78	5.55	5.10	4.38	3.68	3.32	3.15	2.93	2.79	3.43	3.53							
1989	126.99	5.43	5.02	4.37	3.75	3.45	3.33	3.20	3.16	3.71	3.91	4.28						
1990	133.09	5.38	5.00	4.42	3.87	3.62	3.54	3.47	3.49	3.98	4.20	4.54	4.80					
1991	137.73	5.23	4.87	4.33	3.83	3.61	3.54	3.47	3.49	3.88	4.02	4.19	4.14	3.49				
1992	141.08	5.03	4.68	4.17	3.70	3.49	3.41	3.34	3.34	3.64	3.70	3.75	3.57	2.96	2.43			
1993	144.32	4.85	4.51	4.03	3.59	3.38	3.30	3.22	3.21	3.45	3.47	3.46	3.25	2.74	2.37	2.30		
1994	147.26	4.67	4.34	3.88	3.47	3.27	3.18	3.10	3.08	3.27	3.26	3.22	3.01	2.56	2.26	2.17	2.04	
1995	150.88	4.54	4.22	3.79	3.39	3.20	3.12	3.05	3.01	3.18	3.16	3.11	2.91	2.54	2.31	2.27	2.25	2.46
1996	154.78	4.43	4.13	3.71	3.34	3.16	3.08	3.01	2.97	3.12	3.10	3.04	2.87	2.55	2.36	2.34	2.36	2.52
1997	158.08	4.31	4.02	3.62	3.26	3.09	3.01	2.94	2.90	3.03	3.00	2.94	2.78	2.49	2.32	2.30	2.30	2.39
1998	159.93	4.15	3.86	3.48	3.14	2.97	2.89	2.81	2.77	2.87	2.83	2.76	2.60	2.32	2.16	2.11	2.08	2.09
1999	163.24	4.05	3.77	3.41	3.08	2.92	2.84	2.76	2.72	2.81	2.77	2.70	2.54	2.29	2.15	2.11	2.07	2.08
2000	168.93	4.02	3.76	3.41	3.10	2.95	2.88	2.81	2.77	2.86	2.82	2.76	2.63	2.41	2.29	2.28	2.27	2.31
2001	173.46	3.96	3.71	3.38	3.08	2.93	2.87	2.80	2.77	2.85	2.81	2.76	2.63	2.44	2.33	2.32	2.33	2.37
2002	175.92	3.86	3.61	3.29	3.00	2.86	2.79	2.72	2.69	2.76	2.72	2.66	2.54	2.35	2.25	2.23	2.22	2.25
2003	179.74	3.79	3.55	3.24	2.96	2.82	2.76	2.69	2.66	2.72	2.69	2.63	2.51	2.34	2.24	2.23	2.22	2.24
2004	184.51	3.74	3.51	3.21	2.95	2.82	2.75	2.69	2.66	2.72	2.68	2.63	2.52	2.36	2.27	2.26	2.26	2.28
2005	190.95	3.73	3.51	3.22	2.97	2.85	2.79	2.73	2.70	2.76	2.73	2.68	2.58	2.44	2.36	2.36	2.36	2.39
2006	197.15	3.72	3.50	3.22	2.98	2.86	2.81	2.75	2.72	2.78	2.76	2.71	2.62	2.49	2.42	2.42	2.43	2.46
2007	202.79	3.69	3.48	3.21	2.98	2.86	2.81	2.76	2.73	2.79	2.76	2.72	2.63	2.51	2.45	2.45	2.46	2.49
2008	211.09	3.70	3.50	3.24	3.02	2.91	2.86	2.81	2.79	2.85	2.82	2.79	2.71	2.60	2.54	2.55	2.57	2.61
2009	209.61	3.56	3.36	3.10	2.88	2.77	2.72	2.67	2.64	2.69	2.66	2.62	2.54	2.42	2.36	2.36	2.36	2.38
2010	213.97	3.51	3.32	3.07	2.86	2.75	2.70	2.65	2.62	2.66	2.64	2.60	2.52	2.40	2.35	2.34	2.34	2.36
2011	221.58	3.51	3.32	3.08	2.88	2.78	2.73	2.68	2.65	2.70	2.67	2.64	2.56	2.46	2.41	2.40	2.41	2.43

To	Variable	From 1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1994	147.26																	
1995	150.88	2.46																
1996	154.78	2.52	2.58															
1997	158.08	2.39	2.36	2.14														
1998	159.93	2.09	1.96	1.65	1.17													
1999	163.24	2.08	1.99	1.79	1.62	2.07												
2000	168.93	2.31	2.29	2.21	2.24	2.77	3.48											
2001	173.46	2.37	2.35	2.31	2.35	2.74	3.08	2.69										
2002	175.92	2.25	2.22	2.16	2.16	2.41	2.52	2.05	1.42									
2003	179.74	2.24	2.21	2.16	2.16	2.36	2.44	2.09	1.79	2.17								
2004	184.51	2.28	2.26	2.22	2.23	2.41	2.48	2.23	2.08	2.41	2.65							
2005	190.95	2.39	2.38	2.36	2.39	2.56	2.65	2.48	2.43	2.77	3.07	3.49						
2006	197.15	2.46	2.46	2.45	2.48	2.65	2.73	2.61	2.59	2.89	3.13	3.37	3.25					
2007	202.79	2.49	2.49	2.49	2.52	2.67	2.75	2.64	2.64	2.88	3.06	3.20	3.06	2.86				
2008	211.09	2.61	2.62	2.62	2.66	2.81	2.90	2.82	2.84	3.08	3.27	3.42	3.40	3.47	4.09			
2009	209.61	2.38	2.38	2.36	2.38	2.49	2.53	2.43	2.39	2.53	2.60	2.58	2.36	2.06	1.67	-0.70		
2010	213.97	2.36	2.36	2.34	2.36	2.46	2.49	2.39	2.36	2.48	2.52	2.50	2.30	2.07	1.80	0.68	2.08	
2011	221.58	2.43	2.43	2.42	2.44	2.54	2.58	2.50	2.48	2.60	2.65	2.65	2.51	2.36	2.24	1.63	2.81	3.55

Table 2.4: Adjusted GDP Deflator: Compound Annual Rates of Growth (%) Base Year = 1982-1984

To	Variable	From 1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
1961	19.16																		
1962	19.40	1.27																	
1963	19.59	1.11	0.94																
1964	19.87	1.22	1.19	1.45															
1965	20.21	1.35	1.37	1.59	1.73														
1966	20.76	1.62	1.70	1.96	2.21	2.70													
1967	21.37	1.84	1.95	2.21	2.46	2.83	2.97												
1968	22.26	2.17	2.32	2.60	2.88	3.27	3.56	4.15											
1969	23.34	2.50	2.67	2.97	3.27	3.66	3.98	4.49	4.84										
1970	24.55	2.79	2.98	3.28	3.59	3.96	4.28	4.72	5.00	5.17									
1971	25.75	3.00	3.19	3.48	3.77	4.12	4.40	4.76	4.97	5.04	4.90								
1972	26.83	3.11	3.29	3.56	3.83	4.13	4.37	4.65	4.78	4.76	4.55	4.20							
1973	28.29	3.30	3.49	3.75	4.00	4.29	4.52	4.78	4.91	4.93	4.85	4.82	5.44						
1974	30.82	3.73	3.93	4.21	4.49	4.80	5.06	5.37	5.57	5.72	5.86	6.18	7.18	8.95					
1975	33.71	4.12	4.34	4.63	4.92	5.25	5.54	5.86	6.11	6.32	6.55	6.97	7.91	9.16	9.37				
1976	35.61	4.22	4.43	4.71	4.98	5.28	5.55	5.84	6.05	6.22	6.40	6.70	7.34	7.97	7.49	5.64			
1977	37.84	4.35	4.55	4.82	5.08	5.36	5.61	5.88	6.07	6.23	6.38	6.63	7.12	7.54	7.07	5.94	6.25		
1978	40.45	4.49	4.70	4.95	5.21	5.48	5.72	5.97	6.15	6.30	6.44	6.67	7.08	7.41	7.03	6.26	6.58	6.90	
1979	43.81	4.70	4.91	5.16	5.41	5.68	5.91	6.16	6.35	6.50	6.65	6.87	7.26	7.56	7.29	6.77	7.15	7.60	8.31
1980	47.82	4.93	5.14	5.39	5.64	5.91	6.14	6.39	6.58	6.74	6.90	7.12	7.49	7.79	7.59	7.24	7.65	8.12	8.73
1981	52.33	5.15	5.36	5.61	5.86	6.13	6.36	6.60	6.80	6.96	7.12	7.35	7.71	7.99	7.86	7.60	8.00	8.44	8.96
1982	55.51	5.20	5.40	5.64	5.87	6.12	6.34	6.57	6.74	6.89	7.04	7.23	7.54	7.78	7.63	7.38	7.68	7.97	8.23
1983	57.71	5.14	5.33	5.55	5.77	6.00	6.20	6.40	6.56	6.68	6.80	6.96	7.21	7.39	7.22	6.95	7.14	7.29	7.37
1984	59.87	5.08	5.26	5.47	5.67	5.88	6.06	6.25	6.38	6.48	6.58	6.71	6.92	7.05	6.86	6.59	6.71	6.77	6.75
1985	61.69	4.99	5.16	5.35	5.54	5.74	5.90	6.07	6.18	6.26	6.34	6.44	6.61	6.71	6.51	6.23	6.30	6.30	6.21
1986	63.06	4.88	5.03	5.22	5.39	5.57	5.71	5.86	5.96	6.02	6.07	6.15	6.29	6.36	6.15	5.86	5.88	5.84	5.71
1987	64.82	4.80	4.94	5.11	5.28	5.44	5.57	5.70	5.79	5.84	5.88	5.94	6.06	6.10	5.88	5.60	5.60	5.53	5.38
1988	67.05	4.75	4.88	5.05	5.20	5.35	5.47	5.59	5.67	5.71	5.74	5.79	5.89	5.92	5.71	5.43	5.41	5.34	5.18
1989	69.58	4.71	4.84	5.00	5.14	5.29	5.40	5.51	5.58	5.61	5.64	5.68	5.77	5.79	5.58	5.31	5.29	5.21	5.05
1990	72.27	4.68	4.81	4.95	5.09	5.23	5.34	5.44	5.50	5.53	5.55	5.58	5.66	5.67	5.47	5.22	5.19	5.10	4.96
1991	74.83	4.65	4.76	4.90	5.03	5.16	5.26	5.36	5.41	5.44	5.45	5.48	5.55	5.55	5.36	5.11	5.08	4.99	4.85
1992	76.60	4.57	4.68	4.82	4.94	5.06	5.15	5.24	5.28	5.30	5.31	5.33	5.39	5.38	5.19	4.95	4.90	4.81	4.67
1993	78.29	4.50	4.60	4.73	4.84	4.95	5.04	5.12	5.16	5.17	5.17	5.18	5.23	5.22	5.03	4.79	4.74	4.65	4.50
1994	79.94	4.42	4.52	4.64	4.75	4.86	4.93	5.01	5.04	5.05	5.04	5.05	5.09	5.07	4.88	4.65	4.59	4.50	4.35
1995	81.60	4.35	4.45	4.56	4.66	4.76	4.83	4.90	4.93	4.93	4.92	4.92	4.96	4.93	4.75	4.52	4.46	4.36	4.21
1996	83.15	4.28	4.37	4.48	4.57	4.67	4.73	4.80	4.82	4.82	4.80	4.80	4.83	4.80	4.61	4.39	4.33	4.23	4.08
1997	84.63	4.21	4.30	4.40	4.49	4.58	4.64	4.69	4.71	4.71	4.69	4.68	4.70	4.67	4.49	4.27	4.21	4.11	3.96
1998	85.58	4.13	4.21	4.30	4.39	4.47	4.53	4.58	4.59	4.58	4.56	4.55	4.56	4.53	4.35	4.13	4.07	3.96	3.82
1999	86.84	4.06	4.13	4.22	4.30	4.38	4.43	4.48	4.49	4.48	4.45	4.44	4.45	4.41	4.23	4.02	3.95	3.85	3.71
2000	88.72	4.01	4.08	4.17	4.24	4.32	4.36	4.41	4.42	4.40	4.38	4.36	4.36	4.32	4.15	3.95	3.88	3.77	3.63
2001	90.73	3.96	4.03	4.12	4.19	4.26	4.30	4.34	4.35	4.33	4.31	4.29	4.29	4.25	4.08	3.88	3.81	3.71	3.57
2002	92.19	3.91	3.97	4.05	4.12	4.19	4.23	4.26	4.27	4.25	4.22	4.20	4.20	4.16	3.99	3.80	3.73	3.63	3.49
2003	94.13	3.86	3.93	4.00	4.07	4.13	4.17	4.20	4.21	4.19	4.16	4.13	4.13	4.09	3.92	3.74	3.67	3.57	3.44
2004	96.78	3.84	3.90	3.97	4.04	4.10	4.13	4.17	4.17	4.15	4.12	4.09	4.09	4.05	3.89	3.70	3.64	3.54	3.41
2005	100.00	3.83	3.89	3.96	4.02	4.08	4.11	4.14	4.14	4.12	4.09	4.07	4.07	4.02	3.87	3.69	3.62	3.53	3.41
2006	103.24	3.81	3.87	3.94	4.00	4.06	4.09	4.12	4.12	4.10	4.07	4.05	4.04	4.00	3.85	3.68	3.61	3.52	3.40
2007	106.23	3.79	3.85	3.92	3.98	4.03	4.06	4.09	4.09	4.07	4.04	4.02	4.01	3.97	3.82	3.65	3.59	3.50	3.39
2008	108.57	3.76	3.81	3.88	3.94	3.99	4.02	4.04	4.04	4.02	3.99	3.97	3.96	3.92	3.77	3.61	3.54	3.46	3.35
2009	109.53	3.70	3.75	3.81	3.87	3.92	3.94	3.97	3.96	3.94	3.91	3.88	3.88	3.83	3.69	3.53	3.46	3.38	3.27
2010	111.00	3.65	3.70	3.76	3.81	3.86	3.88	3.91	3.90	3.88	3.84	3.82	3.81	3.76	3.62	3.46	3.40	3.32	3.20
2011	113.37	3.62	3.67	3.73	3.77	3.82	3.84	3.86	3.86	3.83	3.80	3.78	3.76	3.72	3.58	3.43	3.36	3.28	3.17

Table 2.4 (continued). Adjusted GDP Deflator: Compound Annual Rates of Growth (%) Base Year = 1982-1984

To	Variable	From 1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1978	40.45																	
1979	43.81	8.31																
1980	47.82	8.73	9.15															
1981	52.33	8.96	9.29	9.43														
1982	55.51	8.23	8.21	7.74	6.08													
1983	57.71	7.37	7.13	6.47	5.01	3.96												
1984	59.87	6.75	6.45	5.78	4.59	3.85	3.74											
1985	61.69	6.21	5.87	5.23	4.20	3.58	3.39	3.04										
1986	63.06	5.71	5.34	4.72	3.80	3.24	3.00	2.63	2.22									
1987	64.82	5.38	5.02	4.44	3.63	3.15	2.95	2.68	2.51	2.79								
1988	67.05	5.18	4.84	4.32	3.60	3.20	3.05	2.87	2.82	3.12	3.44							
1989	69.58	5.05	4.73	4.26	3.63	3.28	3.17	3.05	3.05	3.33	3.61	3.77						
1990	72.27	4.96	4.66	4.22	3.65	3.35	3.27	3.19	3.22	3.47	3.69	3.82	3.87					
1991	74.83	4.85	4.56	4.15	3.64	3.37	3.30	3.24	3.27	3.48	3.66	3.73	3.70	3.54				
1992	76.60	4.67	4.39	4.00	3.52	3.27	3.20	3.13	3.14	3.29	3.40	3.38	3.26	2.95	2.37			
1993	78.29	4.50	4.23	3.86	3.41	3.18	3.10	3.03	3.02	3.14	3.20	3.15	2.99	2.70	2.29	2.21		
1994	79.94	4.35	4.09	3.74	3.31	3.09	3.01	2.93	2.92	3.01	3.04	2.97	2.81	2.55	2.23	2.16	2.11	
1995	81.60	4.21	3.96	3.63	3.22	3.01	2.93	2.86	2.84	2.91	2.92	2.85	2.69	2.46	2.19	2.13	2.09	2.08
1996	83.15	4.08	3.84	3.52	3.14	2.93	2.85	2.78	2.75	2.80	2.81	2.73	2.58	2.36	2.13	2.07	2.03	1.99
1997	84.63	3.96	3.73	3.41	3.05	2.85	2.77	2.70	2.67	2.71	2.70	2.62	2.48	2.28	2.07	2.01	1.97	1.92
1998	85.58	3.82	3.59	3.29	2.94	2.74	2.66	2.58	2.55	2.58	2.56	2.47	2.33	2.14	1.94	1.86	1.80	1.72
1999	86.84	3.71	3.48	3.19	2.85	2.67	2.59	2.51	2.47	2.49	2.47	2.38	2.24	2.06	1.88	1.81	1.74	1.67
2000	88.72	3.63	3.42	3.14	2.82	2.64	2.56	2.49	2.45	2.47	2.44	2.36	2.23	2.07	1.91	1.85	1.80	1.75
2001	90.73	3.57	3.36	3.10	2.79	2.62	2.55	2.48	2.44	2.45	2.43	2.35	2.24	2.09	1.95	1.90	1.86	1.83
2002	92.19	3.49	3.29	3.03	2.73	2.57	2.50	2.43	2.39	2.40	2.38	2.30	2.19	2.05	1.91	1.87	1.83	1.80
2003	94.13	3.44	3.24	2.99	2.70	2.55	2.48	2.41	2.38	2.38	2.36	2.29	2.18	2.05	1.93	1.89	1.86	1.83
2004	96.78	3.41	3.22	2.98	2.71	2.56	2.49	2.43	2.40	2.41	2.39	2.32	2.22	2.11	2.00	1.97	1.95	1.93
2005	100.00	3.41	3.23	2.99	2.74	2.59	2.53	2.47	2.44	2.46	2.44	2.38	2.29	2.19	2.09	2.07	2.06	2.06
2006	103.24	3.40	3.23	3.00	2.76	2.62	2.56	2.51	2.48	2.50	2.48	2.43	2.35	2.25	2.17	2.15	2.15	2.15
2007	106.23	3.39	3.21	3.00	2.76	2.63	2.57	2.52	2.50	2.51	2.50	2.45	2.38	2.29	2.21	2.20	2.20	2.21
2008	108.57	3.35	3.18	2.97	2.74	2.61	2.56	2.51	2.49	2.50	2.49	2.44	2.37	2.29	2.21	2.20	2.20	2.21
2009	109.53	3.27	3.10	2.90	2.67	2.55	2.50	2.45	2.42	2.43	2.41	2.36	2.29	2.21	2.14	2.13	2.12	2.12
2010	111.00	3.20	3.04	2.85	2.63	2.51	2.45	2.40	2.38	2.38	2.37	2.32	2.25	2.17	2.10	2.08	2.07	2.07
2011	113.37	3.17	3.02	2.82	2.61	2.49	2.44	2.39	2.37	2.37	2.36	2.31	2.24	2.17	2.10	2.08	2.08	2.08

To	Variable	From 1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1994	79.94																	
1995	81.60	2.08																
1996	83.15	1.99	1.90															
1997	84.63	1.92	1.84	1.78														
1998	85.58	1.72	1.60	1.45	1.12													
1999	86.84	1.67	1.57	1.46	1.30	1.47												
2000	88.72	1.75	1.69	1.63	1.59	1.82	2.16											
2001	90.73	1.83	1.78	1.76	1.76	1.97	2.22	2.27										
2002	92.19	1.80	1.76	1.73	1.73	1.88	2.01	1.94	1.61									
2003	94.13	1.83	1.80	1.79	1.79	1.92	2.04	1.99	1.86	2.10								
2004	96.78	1.93	1.91	1.92	1.93	2.07	2.19	2.20	2.18	2.46	2.82							
2005	100.00	2.06	2.05	2.07	2.11	2.25	2.38	2.42	2.46	2.75	3.07	3.33						
2006	103.24	2.15	2.16	2.19	2.23	2.37	2.50	2.56	2.62	2.87	3.13	3.28	3.24					
2007	106.23	2.21	2.22	2.25	2.30	2.43	2.55	2.61	2.66	2.88	3.07	3.15	3.07	2.90				
2008	108.57	2.21	2.22	2.25	2.29	2.41	2.51	2.56	2.60	2.76	2.90	2.92	2.78	2.55	2.20			
2009	109.53	2.12	2.12	2.14	2.17	2.27	2.35	2.37	2.38	2.49	2.56	2.51	2.30	1.99	1.54	0.88		
2010	111.00	2.07	2.07	2.08	2.11	2.19	2.26	2.27	2.27	2.35	2.38	2.31	2.11	1.83	1.47	1.11	1.34	
2011	113.37	2.08	2.08	2.09	2.11	2.19	2.25	2.25	2.25	2.32	2.35	2.29	2.11	1.89	1.64	1.45	1.74	2.14

2.6   Appendix 2.1

<u>OCACT adjustments to the actual published CPI-W annual growth rates.</u> Between 1978 and 2011, OCACT set the annual growth rate in the adjusted CPI-W to the growth rate in the actual published CPI-W plus an annual growth rate differential, defined as the growth rate in the CPI-U "Research Series" (CPI-U-RS) less the growth rate in the actual published CPI-U. BLS constructs the CPI-U-RS by recalculating the CPI-U back to 1978 using present methodology (see http://stats.bls.gov/cpi/cpirsdc.htm). An exception to this specification was made because BLS introduced an improvement for "rental equivalence" in 1983 for the CPI-U, but not until 1985 for the CPI-W. Thus, for 1983 and 1984, the annual percent change in the adjusted CPI-W is defined as the percent change in the CPI-U-RS less 0.1 percentage point. This adjustment reflects the belief that, had the introductions been simultaneous in 1983, the observed differences in growth between the two inflation measures would have been equal to their published compound average annual difference (0.1 percentage point) over the post-1985 period.

Between 1967 and 1977, the annual growth rate in the adjusted CPI-W was set to the growth rate in the actual published CPI-W less 0.2 percentage point plus an annual growth rate differential, defined as the growth rate in the CPI-U-X1 (a BLS "experimental series" that incorporates the improvement for rental equivalence into the historical CPI-U) less the growth rate in the actual published CPI-U. The 0.2 percentage point adjustment reflects a BLS estimate of the effect of introducing an improved geometric weighting formula into the CPI-W beginning in January 1999. Finally, for 1966 and earlier, the annual growth rate in the adjusted CPI-W was set to the growth rate in the actual published CPI-W less the 0.2 percentage point adjustment for the improved geometric formula.

<u>OCACT adjustments to the actual published PGDP and real GDP (and therefore productivity) annual growth rates.</u> As mentioned above, starting in January 1999, BLS introduced a new geometric weighting formula to the CPI, estimating that it would lower the future annual growth rate in the CPI by about 0.2 percentage point. BEA estimates that this change would have had a 50.0 percent "feed-through" effect on the aggregate annual PGDP growth rate in the past. Thus, due to BLS' introduction of an improved geometric weighting formula to the CPI, BEA lowered the annual growth rate in the aggregate PGDP by about 0.1 percentage point (0.2 * 50.0%). And, since the BLS improvement to the CPI does not alter the historical path of nominal GDP, BEA raised the annual growth rate in the real GDP by about 0.1 percentage point. However, BEA made these adjustments only back to 1978. Thus, to improve consistency, OCACT added the effect of this BLS improvement to the earlier data. That is, for 1978 and each earlier year, OCACT lowered the annual growth rate in the CPI by 0.2 percentage point, lowered the annual growth rate in the aggregate PGDP index by 0.1 percentage point, and raised the annual growth rate in real GDP, and therefore productivity, by 0.1 percentage point. Furthermore, a change in the CPI growth rate affects the PGDP through about 85.0% of the prices used to determine one of the components of the PGDP, that is, the GDP deflator for consumption (PGDP_C). Hence, the annual growth rate for the PGDP_C in 1978 and earlier was lowered by about 0.17 percent (0.2 * 0.85).

3. AVERAGE REAL WAGE DIFFERENTIAL

THE 2013 TRUSTEES REPORT
OFFICE OF THE CHIEF ACTUARY, SOCIAL SECURITY ADMINISTRATION

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3.1 Summary

For the 2013 Trustees Report, over the 65-year period from 2022 to 2087, the Trustees set the average annual growth rate in the OASDI covered wage to 3.5 percent, 3.9 percent, and 4.3 percent for alternatives I, II, and III, respectively (Table 3.1). [44,45] Also for the 2013 Trustees Report, the Trustees set the assumed ultimate annual rates of increase in the CPI-W to 1.8 percent, 2.8 percent, and 3.8 percent for alternatives I, II, and III, respectively (Table 2.1). Thus, for the 2013 Trustees Report, the Trustees set the average real wage differential, over the 65-year period from 2022 to 2087, to 1.7 percent (3.5 less 1.8), 1.1 percent (3.9 less 2.8), and 0.5 percent (4.3 less 3.8) for alternatives I, II, and III, respectively. [46] These average real wage differentials for alternatives I, II, and III are the same as those used in the 2012 Trustees Report.

Table 3.1: Assumed Average Real Wage Differential

Average Annual Percent Change (2022 to 2087)	2013 Trustees Report Alternative			2012 Trustees Report Alternative			2013 Trustees Report Less 2012 Trustees Report		
	I	II	III	I	II	III	I	II	III
Average Nominal Wage	3.5	3.9	4.3	3.5	3.9	4.3	0.0	0.0	0.0
Less: CPI-W	1.8	2.8	3.8	1.8	2.8	3.8	0.0	0.0	0.0
Equals: Average Real Wage Differential	1.7	1.1	0.5	1.7	1.1	0.5	0.0	0.0	0.0

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[44] The 65-year period begins with the last year of the 10-year (2012 to 2022) "short-range" projection period and ends with the last year of the 75-year (2012 to 2087) "long-range" projection period.

[45] For the 2009 Trustees Report, the annual growth rate in the average OASDI covered wage was assumed to have a constant "ultimate" value over the last 65 years of the projection period. This was due, in part, to the assumption that the ratio of wages to compensation would decline at a fixed "ultimate" rate per year (e.g., 0.2 percent for alternative II) over the period. Starting with the 2010 Trustees Report, the annual growth rate in the average OASDI covered wage was assumed to vary over the last 65 years of the projection. This was due to the assumption that the ratio of wages to compensation would decline at a varying rate over the period due, in turn, to the assumed effect of the 2010 health care legislation on employer contributions to employee group health insurance.

[46] The real wage differential is defined as the annual percent change in the average OASDI covered wage minus the annual percent change in the CPI.

3.2   Definition of Average Real Wage Differential

The average OASDI covered wage is defined as the ratio of OASDI covered wages to employment. The annual real wage differential is defined as the annual percentage change in the average OASDI covered wage minus the annual percentage change in the CPI. The average real wage differential over the 65-year period from 2022 to 2087 is the average of annual real wage differentials over the period.

Both the income to the Social Security program and the benefits paid are related to total covered earnings (i.e., the combination of covered wages and covered net earnings from self-employment). For this reason, the growth in average earnings, not average wages, is the subject of the balance of this section.

3.3   Average Real Economy-Wide Earnings Growth

Average real earnings in the total U.S. economy are defined as the ratio of total nominal earnings (wage and salary disbursements and net proprietors' income) to total adjusted civilian employment (see Appendix 3.1) and U.S. Armed Forces, divided by the adjusted CPI-W. BEA estimates historical values for nominal earnings as part of its broader responsibility of maintaining the NIPA for the U.S. economy. BLS estimates the CPI-W and the civilian employment from its monthly CPS data. Because CPS data for the U.S. represent average weekly employment, the average earnings for the total U.S. economy represent average weekly earnings for those employed.

Average real weekly earnings in the total U.S. economy increased at an average annual rate of 0.86 percent over the last 40 years (1971-2011), 1.21 percent over the last 30 years (1981-2011), 1.32 percent over the last 20 years (1991-2011), and 0.25 percent over the last 10 years (2001-2011). The average real earnings of OASDI covered workers (which differs from average real weekly earnings in the total economy partly because of changes in the number and kind of workers covered by the OASDI program) increased at an average annual rate of 0.89 percent over the last 40 years, 1.06 percent over the last 30 years, 1.08 percent over the last 20 years, and 0.26 percent over the last 10 years (see Table 3.2 below). Note that these periods do not cover complete economic cycles and thus may not be the best indicators of true trend growth rates.

Federal civilian government employees will become completely covered under OASDI around 2030 (all employees hired after 1983 are covered). As a result, the composition of OASDI covered employment, which has varied since 1940, will stabilize around 2030. This suggests that it is reasonable to evaluate the 1.1 percent proposed average rate of increase for real covered earnings for alternative II in relation to the historical growth rate in real earnings for all workers in the total economy. Therefore, the balance of this section focuses on the past trends for average earnings in the U.S. economy.

Considering complete economic cycles, the average annual growth rate in real earnings for all workers in the total U.S. economy was 2.09 percent from 1966 to 1973 (7 years), -0.47 percent from 1973 to 1979 (6 years), 0.50 percent from 1979 to 1989 (10 years), 2.15 percent from 1989

to 2000 (11 years), and 0.67 percent from 2000 to 2007 (7 years).[47] The 1.1 percent assumed average future annual real growth rate in average economy-wide earnings is significantly higher than the 0.89 percent historical average annual real growth rate over the last four complete economic cycles (the 34-year period from 1973 to 2007), but equal to the 1.10 percent historical average annual real growth rate over the last five complete cycles (41-year period from 1966 to 2007).

Table 3.2: Average Annual Percentage Change in Average Real Earnings: Comparison of the U.S. Economy to OASDI Covered

Period	Average Real Earnings for U.S. Economy	Total Links	Ratio of Employed Labor Force to Covered Workers	Ratio of Covered Earnings to U.S. Earnings	Average Real Earnings for OASDI Covered
Historical:	(1)	(2)	(3)	(4)	(5)
By Decade:					
1961-1971	2.51	-0.29	-0.57	0.29	2.21
1971-1981	-0.18	0.55	0.31	0.24	0.37
1981-1991	0.99	0.03	-0.04	0.07	1.02
1991-2001	2.39	-0.47	-0.19	-0.27	1.92
2001-2011	0.25	0.01	0.06	-0.06	0.26
1961-2011	1.19	-0.03	-0.09	0.05	1.15
1971-2011	0.86	0.03	0.04	-0.01	0.89
1981-2011	1.21	-0.14	-0.06	-0.09	1.06
1991-2011	1.32	-0.23	-0.06	-0.17	1.08
2001-2011	0.25	0.01	0.06	-0.06	0.26
By Complete Economic Cycle (Peak-to-Peak):					
Individual Cycle					
1966-1973	2.09	-0.25	-0.34	0.09	1.84
1973-1979	-0.47	1.02	0.49	0.53	0.55
1979-1989	0.50	0.17	0.10	0.07	0.67
1989-2000	2.15	-0.45	-0.20	-0.25	1.69
2000-2007	0.67	-0.08	0.05	-0.13	0.59
Last Two Cycles					
1989-2007	1.57	-0.31	-0.10	-0.20	1.26
Last Three Cycles					
1979-2007	1.19	-0.14	-0.03	-0.11	1.05
Last Four Cycles					
1973-2007	0.89	0.07	0.06	0.01	0.96
Last Five Cycles					
1966-2007	1.10	0.01	-0.01	0.02	1.11

The real growth rate in average earnings of all workers in the economy was depressed for the 1973-1979 and 1979-1989 cycles in a way not expected to be repeated in the future. During this

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[47] Peaks in economic cycles roughly follow the NBER cycle dating, except for short recoveries such as 1980-81, which are not counted as separate cycles.

period, the baby boom generation reached working age and the proportion of women in the labor force increased dramatically. As a result, the economy accommodated an extraordinary number of relatively low-paid (inexperienced and young) workers, thus depressing the real growth in the overall average earnings. However, the inclusion of baby boomers in the labor force ended in the mid-1980s, and the increasing percentage of women under age 60 in the labor force stabilized more recently.

The rapid increase in average earnings during the complete economic cycle from 1989 to 2000 may reflect maturation of the baby boomers and women in the labor force. The large number of baby boomers and women in the labor force have been reaching prime working ages and thus boosted growth since 1989. This kind of swing in demographic trends is not projected to occur in the future, so consideration of the longer period of the last five complete economic cycles seems appropriate. This approach allows us to average out the effects of past demographic trends, which initially depressed and later boosted average earnings growth.

Additional circumstances contributing to potential future growth are discussed in the next two sections on productivity growth and earnings links to productivity.

3.3.1   Productivity

Total-economy productivity is defined as the ratio of real GDP to total hours worked in the U.S. economy. For the 2013 Trustees Report, the Trustees set the assumed ultimate annual rates of increase in total-economy productivity to 1.98 percent, 1.68 percent, and 1.38 percent for alternatives I, II, and III, respectively. OCACT believes that these ultimate rates of increase for total-economy productivity are approximately consistent with ultimate annual rates of increase in nonfarm business productivity of 2.39 percent, 2.03 percent, and 1.67 percent for alternatives I, II, and III, respectively (see Section 1).

3.3.2   Other Components: Links between Real Earnings and Productivity

Analysis of the links between productivity and average real earnings gains shows that not all of the historical gains in productivity have resulted in proportional increases in average real earnings. For example, over the last four economic cycles (1973-2007), average real earnings increased at an average annual rate of only 0.89 percent per year, while productivity for the total U.S. economy increased at 1.58 percent per year. The approximate difference of -0.67 percent per year (1.0089 / 1.0158) was due to changes in the links, that is, those factors that connect productivity to average real earnings in a multiplicative fashion. Table 3.3 summarizes the U.S. experience over the last five decades for each of these factors.[48] They include the ratio of

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[48] For consistency, Section 3 calculates values for productivity, hours per week, price differential, and average real earnings using adjusted data for the CPI, PGDP, real GDP, and employment (weeks worked). Hence, Table 3.3 contains adjusted productivity values which may not equal the unadjusted productivity values on Table 1.4 in Section 1. Adjustments to the CPI, PGDP and real GDP are described in Appendix 2.1. Adjustments to employment are described in Appendix 3.1.

compensation to nominal GDP, the ratio of earnings to compensation, the ratio of total hours worked to total average (weekly) employment, and the ratio of the gross domestic product implicit price deflator (PGDP) to the CPI-W. Each is discussed separately below.

Table 3.3: Average Annual Percentage Change in Average Real Earnings: Total U.S. Economy and Its Components

Period	Productivity	Total Links	Compensation to GDP	Earnings to Compensation	Hours per Week	Price Differential	Residual	Average Real Earnings
Historical:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
By Decade:								
1961-1971	2.77	-0.26	0.03	-0.34	-0.31	0.37	0.00	2.51
1971-1981	1.45	-1.59	-0.31	-0.61	-0.54	-0.14	0.00	-0.18
1981-1991	1.35	-0.38	-0.08	-0.12	0.00	-0.18	0.00	0.99
1991-2001	1.87	0.51	0.48	0.17	0.25	-0.38	0.00	2.39
2001-2011	1.81	-1.53	-0.60	-0.27	-0.44	-0.22	0.00	0.25
1961-2011	1.85	-0.65	-0.10	-0.24	-0.21	-0.11	0.00	1.19
1971-2011	1.62	-0.75	-0.13	-0.21	-0.18	-0.23	0.00	0.86
1981-2011	1.68	-0.47	-0.07	-0.07	-0.06	-0.26	0.00	1.21
1991-2011	1.84	-0.51	-0.06	-0.05	-0.10	-0.30	0.00	1.32
2001-2011	1.81	-1.53	-0.60	-0.27	-0.44	-0.22	0.00	0.25
By Complete Economic Cycle (Peak-to-Peak):								
Individual Cycle								
1966-1973	2.36	-0.26	0.45	-0.44	-0.72	0.45	0.00	2.09
1973-1979	1.17	-1.61	-0.34	-0.67	-0.57	-0.04	0.00	-0.47
1979-1989	1.30	-0.79	-0.31	-0.14	-0.07	-0.27	0.00	0.50
1989-2000	1.76	0.39	0.40	0.13	0.25	-0.38	0.00	2.15
2000-2007	2.06	-1.36	-0.57	-0.25	-0.51	-0.04	0.00	0.67
Last Two Cycles								
1989-2007	1.87	-0.30	0.02	-0.02	-0.05	-0.25	0.00	1.57
Last Three Cycles								
1979-2007	1.67	-0.47	-0.10	-0.06	-0.06	-0.26	0.00	1.19
Last Four Cycles								
1973-2007	1.58	-0.67	-0.14	-0.17	-0.15	-0.22	0.00	0.89
Last Five Cycles								
1966-2007	1.71	-0.60	-0.04	-0.21	-0.25	-0.10	0.00	1.10
Recommeded Future Average Annual Rates of Increase for the 2013 Trustees Report (2022-2087)								
I	1.98	-0.27	0.00	-0.03	0.05	-0.29	0.00	1.70
II	1.68	-0.55	0.00	-0.11	-0.05	-0.39	0.00	1.12
III	1.38	-0.83	0.00	-0.20	-0.15	-0.48	0.00	0.54

3.3.2.1   Ratio of Compensation to Nominal GDP

The first link is the ratio of total compensation to nominal GDP, or the total compensation ratio (CR). Total compensation is the sum of employee compensation and self-employed (proprietors') income to nominal GDP. For the 2013 Trustees Report, the Trustees set the assumed ultimate annual rate of change in the CR to 0.0 percent in alternatives I, II, and III. This is consistent with the relatively small average annual growth rate of -0.04 percent experienced over the last five economic cycles (the 41-year period from 1966 to 2007).

The CR is closely related to the labor's share of total output. Most economists believe that the shares of total output going to the various factors of production will be stable in the long run. Therefore, OCACT believes that it is reasonable to assume the CR will be a constant in the long-range future.

3.3.2.2   Ratio of Earnings to Compensation

The second link is the ratio of total worker earnings to compensation. Using NIPA definitions, total worker earnings are the sum of total wage and salary disbursements and total proprietors' income. Total compensation is the sum of employee compensation and total proprietors' income. Total employee compensation is the sum of total wage and salary disbursements, employer contributions for employee pension and insurance funds, and employer contributions to government social insurance. Employer contributions to government social insurance include payments for public insurance and publicly mandated insurance such as for unemployment, workers' compensation, Medicare, and Social Security.

The average annual rate of change for the ratio was -0.21 percent from 1966 to 2007, a 41-year period that covers the last five peak-to-peak economic cycles. The historical decline in the ratio has been due primarily to the relatively faster growth in employer contributions to employee pensions and health insurance.

Most employer contributions to pensions are for employees in the private sector and are composed of contributions to defined-benefit and defined-contribution plans. Since 2000, employer contributions to employee defined-benefit plans have risen sharply due to the decline in the stock market and relatively low interest rates. It is plausible to expect these contributions to decline in the near future if interest rates and the stock market rebound. OCACT also expects a relative increase in employer contributions to employee pension funds due to increased life expectancy, and a relative decrease due to a continued shift from defined-benefit to defined-contribution plans.

Contributions to employer-sponsored group health insurance (ESI) in the future are expected to be significantly affected by the health care legislation enacted in 2010. This expectation led to a significant change in the assumed future path of the ratio of earnings to compensation between the 2009 and 2010 Trustees Reports.

For the 2009 Trustees Report, the ratio of wages and salaries disbursements (WSD) to employee compensation (WSS) was assumed to decline at a fixed "ultimate" annual rate in each of the last 65 years of the 75-year projection horizon. The assumed ultimate annual rate of change in the ratio of WSD to WSS was set to -0.1, -0.2, and -0.3 percentage point for alternative I, II, and III, respectively. The assumed average annual rate of change of -0.20 percent for alternative II was roughly consistent with the historical record over the last 50 years and the assumed average annual rate of increase in the ratio of ESI to WSS over the next 75 years. In turn, the assumed average annual rate of increase in the ratio of ESI to WSS was mostly based on the Centers for Medicare and Medicaid Services' (CMS) assumption that the average annual growth rate in

national health care expenditures will be about 1.0 percentage point higher than the average annual growth rate in GDP (and in WSS).

For the 2010 Trustees Report, CMS projected components of national health care expenditures, including ESI, under pre-new-law assumptions and new-law assumptions (i.e., before and after the new health care reform legislation enacted in 2010). The more detailed CMS data enabled projection of annual rates of change for the ratio of WSD to WSS.

For alternative II pre-new-law assumptions, the projected annual rate of change in the ratio of WSD to WSS averaged:

- -0.01 percentage point over the first 10 years (i.e., from 2009 to 2019),
- -0.27 percentage point over the next 30 years (from 2019 to 2049),
- -0.20 percentage point over the last 35 years (from 2049 to 2084), and
- -0.20 percentage point over the total 75-year projection horizon (from 2009 to 2084).

Although the projected 75-year average rate of change in the ratio of WSD to WSS was approximately 0.20 percent per year for alternative II in both the 2009 Trustees Report and in the 2010 Trustees Report pre-new-law assumptions, the annual rates of change for each year were different. For alternative II, the projected average annual rate of change in the ratio for the 2010 Trustees Report pre-new-law assumptions, compared to that for the 2009 Trustees Report, was:

- Higher by 0.19 percentage point (-0.01 less -0.20) over the first 10 years of the 75-year projection horizon,
- Lower by 0.07 percentage point (-0.27 less -0.20) over the next 30 years, and
- About equal at -0.20 percentage point over the last 35 years.

For the alternative II new-law assumptions, CMS incorporated the effects of the new health care legislation and updated its projection of ESI, which gave a corresponding change in projected annual rates of change for the ratio of WSD to WSS. For the alternative II new-law assumptions, the projected annual rate of change in the ratio of WSD to WSS averaged:

- +0.02 percentage point over the first 10 years (i.e., from 2009 to 2019),
- -0.11 percentage point over the next 30 years (from 2019 to 2049),
- -0.15 percentage point over the last 35 years (from 2049 to 2084), and
- -0.13 percentage point over the total 75-year projection horizon (from 2009 to 2084).

The projected average annual rate of change in the ratio of WSD to WSS was higher than in the pre-new-law assumptions by:
- 0.03 percentage point (+0.02 less -0.01) over the first 10 years of the 75-year projection horizon,
- 0.16 percentage point (-0.11 less -0.27) over the next 30 years,
- 0.05 percentage point (-0.15 less -0.20) over the last 35 years, and

- 0.07 percentage point (-0.13 less -0.20) over the total 75-year projection horizon.

For the 2013 Trustees Report, the Trustees set a path for the annual rates of change in the ratio of WSD to WSS over the last 65 years of the projection horizon (2022 to 2087) consistent with the annual rates of change over the same period from the 2012 Trustees Report. This will result in an average annual rate of growth in the ratio of WSD to WSS of about -0.1 percent over the last 65 years of the 75-year projection period.

Hence, for the 2013 Trustees Report, the Trustees set the average annual rate of change in the ratio of wages to employee compensation over the last 65 years of the projection horizon (2022 to 2087) to -0.03, -0.13, and -0.23 percentage point for alternatives I, II, and III, respectively. Consistent with this, the Trustees set the average annual rate of change in the ratio of earnings to total compensation over the last 65 years of the projection horizon (2022 to 2087) to -0.03, -0.11, and -0.20 percentage point for alternatives I, II, and III, respectively.

3.3.2.3   Average Hours Worked

The third link is average hours worked per week (AHW), defined as the ratio of total hours worked to total employment in the U.S. economy. Its compounded annual rate of change is shown in Table 3.4. Total hours worked in the U.S. economy is an unpublished series provided by BLS, based mostly on the CES. Total employment, computed on an average weekly basis, is the sum of civilian employment and the U.S. Armed Forces. BLS publishes total civilian employment from the CPS. The Census Bureau provides estimates for the U.S. Armed Forces. For the 2013 Trustees Report, the Trustees set the assumed ultimate annual rate of change in average hours worked to +0.05 percent, -0.05 percent and -0.15 percent in alternatives I, II, and III, respectively. These rates of increase are the same as those used in the 2012 Trustees Report.

The average annual rate of change in AHW was -0.25 percent over the last five economic cycles, a 41-year period from 1966 to 2007. Looking at individual cycles, the average annual rate of change in AHW was -0.72 percent, -0.57 percent, -0.07 percent, 0.25 percent, and -0.51 percent, over the 1966-1973, 1973-1979, 1979-1989, 1989-2000, and 2000-2007 periods, respectively. To reflect, in part, the shift from negative to positive rates of change over the 1966 to 2000 period, the Trustees raised the assumed ultimate intermediate case annual rate of change in AHW from -0.2 percent for the 1996 Trustees Report to -0.1 percent for the 1997 through 2002 Reports, and to 0.0 percent for the 2003 through 2011 Reports.

At least some of the reversal in the historical decline in AHW between 1982 and 1999 is due to changes in the education and age-sex distributions of the workforce. Workers with higher education tend to work more hours than their less-educated counterparts, males tend to work more hours than females, and prime-age workers more than the very young and the very old. In analyses for the 2001 Trustees Reports (see memorandum dated October 6, 2000 on AHW for more details), OCACT estimated that, due to changes in the education and age-sex distributions of the workforce alone, the average annual rate of change in AHW increased by about 0.18 percent per year over the 1979-1989 period, and by 0.06 percent over the 1989-1998 period. Thus, as a rough approximation, the underlying "trend" rate of change in the AHW was

estimated to be about -0.25 percent (-0.07 − 0.18) over the 1978-1989 economic cycle, and about 0.19 percent (0.25 − 0.06) over the 1989-2000 economic cycle.

Other data from the CPS also suggested that the trend movement in the average annual rate of change in AHW was close to 0.0 percent over the 1989 to 2000 period. BLS publishes a CPS-based measure of average hours worked per week for the total labor force (AHW_CPS). The average annual rate of change in the AHW_CPS was about 0.02 percent over the 1989 to 2000 period. If the effect of changes in the education and age-sex distributions of the workforce is removed from this measure, the residual average annual rate of change in the AHW_CPS would have been about -0.04 percent (0.02 − 0.06) over the period.

The average annual rate of change in AHW was -0.51 percent over the last economic cycle, a 7-year period from 2000 to 2007, suggesting a return to the steep declines over the period from 1966 to 1979. However, the magnitude of this drop should be viewed with some uncertainty because the average annual rate of change in AHW_CPS suggests a much more moderate decline of about 0.22 percent over the period. Regardless, the return to declines in the rate of change in AHW since 2000 was substantial. Accordingly, the Trustees lowered the assumed ultimate annual rate of change in AHW to -0.05 percent for the 2012 Report, or approximately equal to the average annual rate of change of -0.06 percent over the last three economic cycles, a 28-year period from 1979 to 2007.

OCACT believes that there are factors that may affect the future AHW in offsetting ways. On one hand, the assumed steady increases in productivity will allow workers to gradually increase leisure time while still maintaining increases in weekly and annual earnings. On the other hand, OCACT also believes that the assumed future increases in life expectancy will raise labor force participation rates for older workers and may also raise AHW, holding other factors constant. The average projected changes in the education and age-sex distributions of the workforce are not expected to significantly affect the average annual rate of change in the AHW in the future.

3.3.2.4   Price Differential (Expressed as Ratio of PGDP to CPI-W)

The final link is the ratio of the PGDP to the CPI-W. Including this ratio is necessary because nominal earnings depend on nominal GDP (i.e., the product of real GDP and the PGDP), but are converted to real earnings using the CPI-W. For the 2013 Trustees Report, the Trustees set the assumed ultimate price differential (expressed as the PGDP less CPI-W average annual rates of increase) to -0.3, -0.4, and -0.5 percentage point for alternative I, II, and III, respectively. For alternative II, the 0.4 percentage point price differential is the sum of a 0.3 percentage point computational difference and a 0.1 percentage point coverage difference (see Section 2.3). These values are unchanged from the ones assumed in the 2012 Trustees Report.

3.3.2.5   Total Links

The average annual change in the total links was -0.47 percent over the last three economic cycles and -0.67 percent over the last four cycles. For the 2013 Trustees Report, the Trustees set the assumed average annual changes in the total links to approximately -0.27 percentage

point, -0.55 percentage point, and -0.83 percentage point for alternatives I, II, and III, respectively.

3.4   Projections from Other Forecasters

Global Insight, Inc. includes projections through 2042 in its latest long-run trend forecast (see August 2012 30-year US Macro Trend Projection). Global Insight, Inc. projects that the average annual growth rate for average real U.S. earnings will slow from about 1.6 percent over the 10-year period from 2022 to 2032 to about 1.1 percent over the 5-year period from 2038 to 2042. Macroeconomic Advisers publishes its latest long-run projections (*Long-Term Economic Outlook*, Third Quarter, 2012) through 2021. For 2020 and 2021, it projects an average annual growth rate for average real U.S. earnings of about 1.6 percent. Moody's Analytics' August 2012 forecast extends to 2042. Over the 20-year period from 2022 to 2042, Moody's Analytics projects that the annual growth rate for average real U.S. earnings will average 1.3 percent.

The Office of Management and Budget (OMB) Mid-Session Review of the Fiscal Year 2013 Budget includes projections through 2090. OMB projects that the annual growth rate for average real U.S. earnings will average about 1.5 percent for the 65-year period from 2022 to 2087. The Congressional Budget Office (CBO) June 2012 report, *The 2012 Long-Term Budget Outlook*, includes projections through 2087. CBO projects that the annual growth rate for average real U.S. wages will average about 1.4 percent from 2022 to 2087. The Social Security Advisory Board's 2011 Technical Panel on Assumptions and Methods recommended assuming an ultimate (i.e., long-range average) annual rate of increase in the average real wage of 1.5 percent for alternative II.

Table 3.4: Average Hours Worked per Week, Total U.S.: Compound Annual Rates of change (%)

To	Variable	From 1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
1961	37.47																		
1962	37.74	0.73																	
1963	37.52	0.07	-0.59																
1964	37.67	0.18	-0.09	0.40															
1965	37.93	0.30	0.16	0.54	0.68														
1966	38.11	0.34	0.24	0.52	0.58	0.48													
1967	37.63	0.07	-0.06	0.07	-0.04	-0.40	-1.27												
1968	37.52	0.02	-0.10	0.00	-0.10	-0.36	-0.78	-0.28											
1969	37.52	0.01	-0.09	0.00	-0.08	-0.27	-0.52	-0.15	-0.01										
1970	36.64	-0.25	-0.37	-0.34	-0.46	-0.69	-0.98	-0.88	-1.18	-2.33									
1971	36.34	-0.31	-0.42	-0.40	-0.51	-0.71	-0.95	-0.87	-1.06	-1.58	-0.82								
1972	36.27	-0.30	-0.40	-0.38	-0.47	-0.64	-0.82	-0.73	-0.84	-1.12	-0.50	-0.18							
1973	36.23	-0.28	-0.37	-0.35	-0.43	-0.57	-0.72	-0.63	-0.70	-0.87	-0.37	-0.15	-0.11						
1974	35.69	-0.37	-0.47	-0.45	-0.54	-0.67	-0.82	-0.75	-0.83	-0.99	-0.66	-0.60	-0.81	-1.51					
1975	35.06	-0.47	-0.57	-0.56	-0.65	-0.78	-0.92	-0.88	-0.96	-1.12	-0.88	-0.89	-1.13	-1.63	-1.75				
1976	34.93	-0.47	-0.55	-0.55	-0.63	-0.75	-0.87	-0.82	-0.89	-1.02	-0.79	-0.79	-0.94	-1.22	-1.07	-0.38			
1977	34.91	-0.44	-0.52	-0.52	-0.59	-0.69	-0.80	-0.75	-0.80	-0.90	-0.69	-0.67	-0.77	-0.93	-0.74	-0.22	-0.07		
1978	35.05	-0.39	-0.46	-0.45	-0.51	-0.61	-0.70	-0.64	-0.68	-0.75	-0.55	-0.51	-0.57	-0.66	-0.45	-0.01	0.17	0.41	
1979	35.01	-0.38	-0.44	-0.43	-0.49	-0.57	-0.65	-0.60	-0.63	-0.69	-0.50	-0.46	-0.50	-0.57	-0.38	-0.04	0.08	0.15	-0.10
1980	34.74	-0.40	-0.46	-0.45	-0.51	-0.58	-0.66	-0.61	-0.64	-0.70	-0.53	-0.50	-0.54	-0.60	-0.45	-0.18	-0.13	-0.16	-0.44
1981	34.41	-0.43	-0.49	-0.48	-0.53	-0.61	-0.68	-0.64	-0.66	-0.72	-0.57	-0.54	-0.59	-0.64	-0.52	-0.31	-0.30	-0.36	-0.62
1982	34.14	-0.44	-0.50	-0.50	-0.55	-0.62	-0.69	-0.65	-0.67	-0.72	-0.59	-0.57	-0.60	-0.66	-0.55	-0.38	-0.38	-0.44	-0.66
1983	34.28	-0.40	-0.46	-0.45	-0.50	-0.56	-0.62	-0.58	-0.60	-0.64	-0.51	-0.49	-0.51	-0.55	-0.45	-0.28	-0.27	-0.30	-0.44
1984	34.57	-0.35	-0.40	-0.39	-0.43	-0.49	-0.54	-0.50	-0.51	-0.54	-0.41	-0.38	-0.40	-0.43	-0.32	-0.16	-0.13	-0.14	-0.23
1985	34.64	-0.33	-0.37	-0.36	-0.40	-0.45	-0.50	-0.46	-0.47	-0.50	-0.37	-0.34	-0.35	-0.37	-0.27	-0.12	-0.09	-0.10	-0.17
1986	34.25	-0.36	-0.40	-0.40	-0.43	-0.49	-0.53	-0.49	-0.51	-0.54	-0.42	-0.39	-0.41	-0.43	-0.34	-0.21	-0.20	-0.21	-0.29
1987	34.27	-0.34	-0.39	-0.38	-0.41	-0.46	-0.50	-0.47	-0.48	-0.50	-0.39	-0.37	-0.38	-0.40	-0.31	-0.19	-0.17	-0.18	-0.25
1988	34.52	-0.30	-0.34	-0.33	-0.36	-0.41	-0.45	-0.41	-0.42	-0.44	-0.33	-0.30	-0.31	-0.32	-0.24	-0.12	-0.10	-0.10	-0.15
1989	34.76	-0.27	-0.30	-0.29	-0.32	-0.36	-0.40	-0.36	-0.36	-0.38	-0.28	-0.25	-0.25	-0.26	-0.18	-0.06	-0.04	-0.03	-0.08
1990	34.63	-0.27	-0.31	-0.30	-0.32	-0.36	-0.40	-0.36	-0.36	-0.38	-0.28	-0.25	-0.26	-0.27	-0.19	-0.08	-0.06	-0.06	-0.10
1991	34.41	-0.28	-0.32	-0.31	-0.33	-0.37	-0.41	-0.37	-0.38	-0.39	-0.30	-0.27	-0.28	-0.29	-0.21	-0.12	-0.10	-0.10	-0.14
1992	34.22	-0.29	-0.33	-0.32	-0.34	-0.38	-0.41	-0.38	-0.38	-0.40	-0.31	-0.29	-0.29	-0.30	-0.23	-0.14	-0.13	-0.13	-0.17
1993	34.51	-0.26	-0.29	-0.28	-0.30	-0.34	-0.37	-0.33	-0.33	-0.35	-0.26	-0.23	-0.24	-0.24	-0.18	-0.09	-0.07	-0.07	-0.10
1994	34.95	-0.21	-0.24	-0.23	-0.25	-0.28	-0.31	-0.27	-0.27	-0.28	-0.20	-0.17	-0.17	-0.17	-0.10	-0.02	0.00	0.01	-0.02
1995	35.27	-0.18	-0.21	-0.19	-0.21	-0.24	-0.27	-0.23	-0.23	-0.24	-0.15	-0.12	-0.12	-0.12	-0.06	0.03	0.05	0.06	0.04
1996	35.18	-0.18	-0.21	-0.19	-0.21	-0.24	-0.27	-0.23	-0.23	-0.24	-0.16	-0.13	-0.13	-0.13	-0.06	0.02	0.04	0.04	0.02
1997	35.39	-0.16	-0.18	-0.17	-0.19	-0.22	-0.24	-0.20	-0.20	-0.21	-0.13	-0.10	-0.10	-0.10	-0.04	0.04	0.06	0.07	0.05
1998	35.60	-0.14	-0.16	-0.15	-0.17	-0.19	-0.21	-0.18	-0.17	-0.18	-0.10	-0.08	-0.07	-0.07	-0.01	0.07	0.09	0.09	0.08
1999	35.72	-0.13	-0.15	-0.14	-0.15	-0.18	-0.20	-0.16	-0.16	-0.16	-0.09	-0.06	-0.06	-0.05	0.00	0.08	0.10	0.11	0.09
2000	35.71	-0.12	-0.15	-0.13	-0.15	-0.17	-0.19	-0.16	-0.15	-0.16	-0.09	-0.06	-0.06	-0.05	0.00	0.07	0.09	0.10	0.09
2001	35.28	-0.15	-0.17	-0.16	-0.18	-0.20	-0.22	-0.19	-0.19	-0.19	-0.12	-0.10	-0.10	-0.09	-0.04	0.02	0.04	0.05	0.03
2002	34.94	-0.17	-0.19	-0.18	-0.20	-0.22	-0.24	-0.21	-0.21	-0.22	-0.15	-0.13	-0.12	-0.12	-0.08	-0.01	0.00	0.00	-0.01
2003	34.61	-0.19	-0.21	-0.20	-0.22	-0.24	-0.26	-0.23	-0.23	-0.24	-0.17	-0.15	-0.15	-0.15	-0.11	-0.05	-0.03	-0.03	-0.05
2004	34.57	-0.19	-0.21	-0.20	-0.21	-0.24	-0.26	-0.23	-0.23	-0.23	-0.17	-0.15	-0.15	-0.15	-0.11	-0.05	-0.04	-0.04	-0.05
2005	34.54	-0.19	-0.21	-0.20	-0.21	-0.23	-0.25	-0.23	-0.22	-0.23	-0.17	-0.15	-0.15	-0.15	-0.11	-0.05	-0.04	-0.04	-0.05
2006	34.54	-0.18	-0.20	-0.19	-0.21	-0.23	-0.25	-0.22	-0.22	-0.22	-0.16	-0.15	-0.14	-0.15	-0.10	-0.05	-0.04	-0.04	-0.05
2007	34.46	-0.18	-0.20	-0.19	-0.21	-0.23	-0.25	-0.22	-0.22	-0.22	-0.17	-0.15	-0.15	-0.15	-0.11	-0.05	-0.04	-0.04	-0.06
2008	34.14	-0.20	-0.22	-0.21	-0.22	-0.24	-0.26	-0.24	-0.24	-0.24	-0.19	-0.17	-0.17	-0.17	-0.13	-0.08	-0.07	-0.07	-0.09
2009	33.42	-0.24	-0.26	-0.25	-0.27	-0.29	-0.31	-0.28	-0.28	-0.29	-0.24	-0.22	-0.22	-0.22	-0.19	-0.14	-0.13	-0.14	-0.15
2010	33.56	-0.22	-0.24	-0.24	-0.25	-0.27	-0.29	-0.27	-0.27	-0.27	-0.22	-0.20	-0.20	-0.21	-0.17	-0.12	-0.12	-0.12	-0.14
2011	33.76	-0.21	-0.23	-0.22	-0.23	-0.25	-0.27	-0.25	-0.25	-0.25	-0.20	-0.18	-0.18	-0.19	-0.15	-0.11	-0.10	-0.10	-0.11

Table 3.4. Average Hours Worked per Week, Total U.S. (continued): Compound Annual Rates of change (%)

To	Variable	From 1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
1978	35.05																	
1979	35.01	-0.10																
1980	34.74	-0.44	-0.78															
1981	34.41	-0.62	-0.87	-0.96														
1982	34.14	-0.66	-0.84	-0.87	-0.78													
1983	34.28	-0.44	-0.53	-0.45	-0.19	0.41												
1984	34.57	-0.23	-0.25	-0.12	0.16	0.63	0.86											
1985	34.64	-0.17	-0.18	-0.06	0.17	0.48	0.52	0.19										
1986	34.25	-0.29	-0.32	-0.24	-0.09	0.08	-0.03	-0.47	-1.13									
1987	34.27	-0.25	-0.27	-0.19	-0.06	0.08	0.00	-0.29	-0.53	0.08								
1988	34.52	-0.15	-0.16	-0.08	0.05	0.19	0.14	-0.04	-0.11	0.40	0.72							
1989	34.76	-0.08	-0.07	0.01	0.13	0.26	0.23	0.11	0.09	0.50	0.71	0.69						
1990	34.63	-0.10	-0.10	-0.03	0.07	0.18	0.15	0.03	0.00	0.28	0.35	0.16	-0.37					
1991	34.41	-0.14	-0.14	-0.09	0.00	0.09	0.05	-0.07	-0.11	0.10	0.10	-0.10	-0.50	-0.63				
1992	34.22	-0.17	-0.18	-0.13	-0.05	0.02	-0.02	-0.13	-0.17	-0.01	-0.03	-0.22	-0.52	-0.60	-0.57			
1993	34.51	-0.10	-0.10	-0.05	0.03	0.10	0.07	-0.02	-0.05	0.11	0.12	-0.01	-0.18	-0.12	0.14	0.86		
1994	34.95	-0.02	-0.01	0.04	0.12	0.20	0.18	0.11	0.10	0.25	0.28	0.20	0.11	0.23	0.51	1.06	1.26	
1995	35.27	0.04	0.05	0.10	0.18	0.25	0.24	0.18	0.18	0.33	0.36	0.31	0.24	0.37	0.62	1.01	1.09	0.93
1996	35.18	0.02	0.03	0.08	0.15	0.22	0.20	0.15	0.14	0.27	0.29	0.24	0.17	0.26	0.44	0.70	0.64	0.34
1997	35.39	0.05	0.06	0.11	0.18	0.24	0.23	0.18	0.18	0.30	0.32	0.28	0.23	0.31	0.47	0.68	0.63	0.42
1998	35.60	0.08	0.09	0.14	0.20	0.26	0.25	0.21	0.21	0.32	0.35	0.31	0.27	0.35	0.49	0.66	0.62	0.47
1999	35.72	0.09	0.10	0.15	0.21	0.27	0.26	0.22	0.22	0.33	0.35	0.31	0.27	0.35	0.47	0.62	0.58	0.44
2000	35.71	0.09	0.09	0.14	0.20	0.25	0.24	0.20	0.20	0.30	0.32	0.28	0.25	0.31	0.41	0.54	0.49	0.36
2001	35.28	0.03	0.04	0.07	0.13	0.17	0.16	0.12	0.12	0.20	0.21	0.17	0.12	0.17	0.25	0.34	0.28	0.14
2002	34.94	-0.01	-0.01	0.03	0.07	0.12	0.10	0.06	0.05	0.13	0.13	0.09	0.04	0.07	0.14	0.21	0.14	0.00
2003	34.61	-0.05	-0.05	-0.02	0.03	0.07	0.05	0.01	0.00	0.06	0.06	0.02	-0.03	0.00	0.05	0.10	0.03	-0.11
2004	34.57	-0.05	-0.05	-0.02	0.02	0.06	0.04	0.00	-0.01	0.05	0.05	0.01	-0.04	-0.01	0.04	0.09	0.02	-0.11
2005	34.54	-0.05	-0.05	-0.02	0.02	0.05	0.03	0.00	-0.01	0.04	0.04	0.00	-0.04	-0.02	0.03	0.07	0.01	-0.11
2006	34.54	-0.05	-0.05	-0.02	0.01	0.05	0.03	0.00	-0.01	0.04	0.04	0.00	-0.04	-0.02	0.02	0.07	0.01	-0.10
2007	34.46	-0.06	-0.06	-0.03	0.01	0.04	0.02	-0.01	-0.02	0.03	0.03	-0.01	-0.05	-0.03	0.01	0.05	-0.01	-0.11
2008	34.14	-0.09	-0.09	-0.06	-0.03	0.00	-0.02	-0.05	-0.06	-0.01	-0.02	-0.06	-0.09	-0.08	-0.05	-0.01	-0.07	-0.17
2009	33.42	-0.15	-0.16	-0.13	-0.10	-0.08	-0.10	-0.14	-0.15	-0.11	-0.12	-0.15	-0.20	-0.19	-0.16	-0.14	-0.20	-0.30
2010	33.56	-0.14	-0.14	-0.12	-0.09	-0.06	-0.08	-0.11	-0.13	-0.08	-0.09	-0.13	-0.17	-0.16	-0.13	-0.11	-0.16	-0.25
2011	33.76	-0.11	-0.11	-0.09	-0.06	-0.04	-0.05	-0.09	-0.10	-0.06	-0.06	-0.10	-0.13	-0.12	-0.10	-0.07	-0.12	-0.20

To	Variable	From 1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1994	34.95																	
1995	35.27	0.93																
1996	35.18	0.34	-0.25															
1997	35.39	0.42	0.17	0.60														
1998	35.60	0.47	0.31	0.60	0.59													
1999	35.72	0.44	0.32	0.51	0.47	0.34												
2000	35.71	0.36	0.25	0.38	0.30	0.16	-0.03											
2001	35.28	0.14	0.01	0.06	-0.08	-0.30	-0.62	-1.20										
2002	34.94	0.00	-0.13	-0.11	-0.26	-0.47	-0.73	-1.08	-0.97									
2003	34.61	-0.11	-0.24	-0.23	-0.37	-0.56	-0.79	-1.04	-0.96	-0.96								
2004	34.57	-0.11	-0.22	-0.22	-0.33	-0.49	-0.65	-0.81	-0.68	-0.53	-0.11							
2005	34.54	-0.11	-0.21	-0.21	-0.31	-0.43	-0.56	-0.67	-0.53	-0.39	-0.10	-0.10						
2006	34.54	-0.10	-0.19	-0.19	-0.27	-0.38	-0.48	-0.56	-0.43	-0.29	-0.07	-0.05	0.00					
2007	34.46	-0.11	-0.19	-0.19	-0.27	-0.36	-0.45	-0.51	-0.39	-0.28	-0.11	-0.11	-0.11	-0.21				
2008	34.14	-0.17	-0.25	-0.25	-0.33	-0.42	-0.50	-0.56	-0.47	-0.39	-0.27	-0.31	-0.39	-0.58	-0.94			
2009	33.42	-0.30	-0.38	-0.40	-0.48	-0.57	-0.67	-0.74	-0.68	-0.64	-0.58	-0.68	-0.82	-1.09	-1.53	-2.12		
2010	33.56	-0.25	-0.33	-0.34	-0.41	-0.49	-0.57	-0.62	-0.56	-0.50	-0.44	-0.49	-0.57	-0.71	-0.88	-0.85	0.43	
2011	33.76	-0.20	-0.27	-0.27	-0.34	-0.41	-0.47	-0.51	-0.44	-0.38	-0.31	-0.34	-0.38	-0.45	-0.51	-0.37	0.51	0.59

3.5   Appendix 3.1

BLS has introduced numerous changes to the Current Population Survey (CPS) concepts over the historical period, such that values for employment are not historically comparable over the period (for more detail on noncomparability of CPS concepts, see http://www.bls.gov/cps/eetech_methods.pdf). To make the total employment series more comparable, OCACT adjusted the published values for the following:

1990 Census **-** 1990 Census-based population controls were introduced in January 1994 by BLS, increasing employment levels for 1990 from the originally-published estimates by about 880,000 (0.7%). BLS later revised the 1990 to 1993 estimates, but not those for earlier years. Consequently, OCACT adjusted the CPS data for 1981 to 1989 using a linear interpolation of the 0.7% increase.

2000 Census - Population controls based on Census 2000 results were introduced by BLS in January 2003. The revised employment series for 2000 was 1.27% (or 1.724 million persons) higher than the previously published series. BLS revised the CPS data only back to January 2000. OCACT adjusted the CPS data back to 1991 by linearly interpolating the 1.27% adjustment.

1994 CPS Methodology Change **-** In 1994, BLS introduced methodology changes and a complete redesign of its CPS. Because the survey redesign and methodology changes raised the aggregate employment for 1994, the series was not comparable with earlier years. Thus, OCACT applied a multiplicative-adjustment factor estimated by Polivka and Miller (1995)[49] to the series for years prior to 1994. The aggregate employment series was adjusted for 1993 and earlier years by a factor of 1.0053.

Population Controls since the 2000 Census **-** Beginning in January 2003, the U.S. Census Bureau reflected its updated population controls in the CPS estimates. The difference between the updated and originally published employment values for December 2002 is an increase of 576,000 persons. Data from December 2002 and earlier are not updated by BLS. OCACT adjusted the employment series back to 2000.

In January 2004, the U.S. Census Bureau reflected revised net international migration estimates in its updated population controls. The difference between the updated and originally published employment values for December 2003 is a decrease of 409,000 persons. Data from December 2003 and earlier are not updated by BLS. OCACT adjusted the employment series back to 2000.

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[49] Anne E. Polivka and Stephen M. Miller, "The CPS after the Redesign: Refocusing the Economic Lens," *Labor Statistics Measurement Issues; Studies in Income and Wealth Volume 60*, Edited by John Haltiwanger, Marilyn E. Manser and Robert Topel, National Bureau of Economic Research, 1998, Table 6. Also available at http://www.bls.gov/ore/pdf/ec950090.pdf . Polivka and Miller's adjustment factors are for employment-population ratios, not employment levels. Because the CPS methodology change affected the employment levels, but not the civilian noninstitutional population, we can use their multiplicative employment-population ratio factors to adjust the employment levels.

Beginning in January 2005, the U.S. Census Bureau began using its updated population controls, which reflected updated vital statistics information, as well as revised estimates of net international migration. The difference between the updated and originally published employment values for December 2004 is a decrease of 45,000 persons. Data from December 2004 and earlier are not updated by BLS. OCACT adjusted the employment series back to 2000.

In January 2006, the U.S. Census Bureau introduced updated population controls, which reflected updated vital statistics information, as well as revised estimates of net international migration. The difference between the updated and originally published employment values for December 2005 is a decrease of 123,000 persons. Data from December 2005 and earlier are not updated by BLS. OCACT adjusted the employment series back to 2000.

In January 2007, the U.S. Census Bureau introduced updated population controls, which reflected revised estimates of net international migration and updated vital statistics information. The difference between the updated and originally published employment values for December 2006 is an increase of 153,000 persons. Data from December 2006 and earlier are not updated by BLS. OCACT adjusted the employment series back to 2000.

Beginning in January 2008, the U.S. Census Bureau began using its updated population controls, which reflected updated vital statistics information, as well as revised estimates of net international migration and the institutional population. The difference between the updated and originally published employment values for December 2007 is a decrease of 598,000 persons. Data from December 2007 and earlier are not updated by BLS. OCACT adjusted the employment series back to 2000.

In January 2009, the U.S. Census Bureau introduced updated population controls, reflecting revised net international migration and vital statistics information. The difference between the updated and originally published employment values for December 2008 is a decrease of 483,000 persons. Data from December 2008 and earlier are not updated by BLS. OCACT adjusted the employment series back to 2000.

Beginning in January 2010, the U.S. Census Bureau began using its updated population controls, reflecting updated vital statistics information, revised estimates of net international migration, as well as methodological changes in the population estimation process. The difference between the updated and originally published employment values for December 2009 is a decrease of 243,000 persons. BLS does not update data from December 2009 and earlier. OCACT adjusted the employment series back to 2000.

In January 2011, the U.S. Census Bureau introduced updated population controls, reflecting revised net international migration, vital statistics information, and some methodological changes in the population estimation process. The difference between the updated and originally published employment values for December 2010 is a decrease of 472,000 persons. BLS does not update data from December 2010 and earlier. OCACT adjusted the employment series back to 2000.

Beginning in January 2012, the U.S. Census Bureau incorporated the Census 2010 population base, as well as adjustments for net international migration, updated vital statistics information, and methodological changes in the population estimation process. The difference between the updated and originally published employment values for December 2011 is an increase of 216,000 persons. BLS does not update data from December 2011 and earlier. OCACT adjusted the employment series back to 2000.

4. UNEMPLOYMENT RATE

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4 Unemployment Rate

4.1 Summary

For the 2013 Trustees Report, the Trustees assume ultimate total civilian unemployment rates (adjusted by the age and sex distribution of the 2010 civilian labor force) of 4.5 percent, 5.5 percent, and 6.5 percent for alternatives I, II, and III, respectively (Table 4.1). These assumptions are the same as those used for the 2012 Trustees Report.

Table 4.1: Assumed Ultimate Total Civilian Unemployment Rate

	2013 Trustees Report Alternative			2012 Trustees Report Alternative			2013 Trustees Report Less 2012 Trustees Report		
	I	II	III	I	II	III	I	II	III
Civilian Unemployment Rate	4.5	5.5	6.5	4.5	5.5	6.5	0.0	0.0	0.0

4.2 Past Experience

BLS publishes civilian unemployment rates, defined as the proportion of unemployed persons in the civilian labor force, by sex and age group as part of its Current Population Survey. The Trustees ultimate civilian unemployment rate assumptions are based on analysis of past experience and expected future conditions and trends. Because the aggregate unemployment rate is sensitive to changes in the age-sex composition of the civilian labor force, OCACT constructed an age-sex-adjusted unemployment rate by weighting the unadjusted age-sex unemployment rates by the age-sex distribution of the 2010 civilian labor force. Since the civilian unemployment rate varies significantly over an economic cycle, it is useful to look at averages over complete economic cycles or long periods (decades). Table 4.2 shows average civilian unemployment rates over complete (peak-to-peak) economic cycles. Over the last two (1989-2007), three (1979-2007), four (1973-2007), and five (1966-2007) complete economic cycles, the unemployment rate averaged 5.1, 5.5, 5.5, and 5.2 percent, respectively.[50] Table 4.3 shows annual values for both the adjusted and unadjusted civilian rates. Over the 10-year, 20-year, 30-year, and 40-year periods ending in 2011, the age-sex adjusted total unemployment rates averaged 6.4, 5.7, 5.9, and 5.8 percent, respectively. Average rates over economic cycles and long periods suggest an ultimate unemployment rate in the 5.1 to 5.9 percent range.

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[50] Peaks in economic cycles roughly follow the NBER cycle dating, except for short recoveries such as 1980-81, which are not counted as separate cycles.

Table 4.2: Civilian Unemployment Rates over Complete Economic Cycles (Peak-to-Peak)

	Total Rate	Age-Sex Adjusted Rate
Individual Cycle:		
1966-1972	4.5	3.8
1973-1978	6.6	5.5
1979-1988	7.3	6.3
1989-2000	5.6	5.1
2001-2007	5.2	5.0
Last Two Cycles		
1989-2007	5.4	5.1
Last Three Cycles		
1979-2007	6.1	5.5
Last Four Cycles		
1973-2007	6.2	5.5
Last Five Cycles		
1966-2007	5.9	5.2

It is also useful to look at unemployment rates over specific periods. Beginning around 1975, and lasting through about 1994, the U.S. experienced generally high unemployment rates. There are several possible explanations for why these higher levels of unemployment occurred during this period. Firstly, due to rapid changes in technology and increased global competition, job searches and retraining may have become more frequent and lasted for longer periods. Secondly, the huge influx of women and baby boomers into the labor market may have increased the quantity of labor supplied beyond the quantity demanded in the 1970s and 1980s. Between 1997 and 2000, rapid economic expansion reduced unemployment rates to unusually low levels. A mild recession raised rates above the ultimate assumed level in 2002 and 2003. In addition, the most recent recession has resulted in rates above the ultimate assumed level.

4.3   Future Expectations

It is not clear how the aging baby boomers will affect the unemployment rate into the future. As these workers age, the working-age population is expected to grow more slowly, particularly in relation to the size of the total population. This demographic shift can be expected to increase the demand for older workers. Meanwhile, the supply of potential older workers is expected to increase, as a significant portion of the baby boomers is expected to remain in the labor force, in many cases, out of necessity (as their life expectancies increase). Even with increases in labor supply from older workers, it seems likely the increasing age-dependency ratio will exert downward pressure on the age-sex-adjusted unemployment rate.

OCACT expects slower rates of increase in female labor force participation, as their rates of labor force participation stabilize closer to, but generally below, those of their male counterparts. The expected slower growth in the labor supply in the future relative to the total population is expected to produce an unemployment rate below the 5.8 percent experienced over the last 40 years (1971-2011). OCACT believes it is more reasonable to expect that the ultimate future age-

sex-adjusted unemployment rate will be between 5.4 and 5.8 percent, the levels experienced over the last 50 years (1961-2011) and 40 years (1971-2011). Therefore, the Trustees set the assumed ultimate average unemployment rate to 5.5 percent (age-sex adjusted to the 2010 labor force) for alternative II.

4.4 Projections from Other Forecasters

The most recent Global Insight, Inc. 30-year trend projections (August 2012 30-Year US Macro Trend Scenario Forecast) assume that the age-sex-adjusted civilian unemployment rate will be 5.4 percent in 2022 and 5.0 percent in 2042. The Global Insight full-employment unemployment rate is 4.8 percent in 2022 and 2042. Macroeconomic Advisers' ten-year forecast (*Long-Term Economic Outlook*, Third Quarter 2012) indicates an age-sex-adjusted civilian unemployment rate of 5.3 percent in 2021. The Moody's Analytics September 2012 forecast shows an age-sex-adjusted civilian unemployment rate of 5.8 percent in 2022 and 6.2 percent in 2042.

The OMB Mid-Session Review of the 2013 Fiscal Year Budget includes long-range projections through 2090. OMB projects an aggregate civilian unemployment rate of 5.4 percent for 2019 and later. The Congressional Budget Office (CBO) *The 2012 Long-Term Outlook* (published June 2012) includes projections through 2087. CBO projects an aggregate civilian unemployment rate of 5.3 percent for 2022 and 5.0 percent for 2087. The Social Security Advisory Board's 2011 Technical Panel on Assumptions and Methods recommended assuming an ultimate (i.e., long-range average) aggregate civilian unemployment rate of 5.5 percent for alternative II.

Table 4.3: Total and Age-Sex Adjusted Civilian Unemployment Rates over Selected Intervals (%)

Year	Total Rate											Age-Sex Adjusted Rate										
	Annual Average over the Following Number of Years											Annual Average over the Following Number of Years										
	1	5	10	15	20	25	30	35	40	45	50	1	5	10	15	20	25	30	35	40	45	50
1961	6.7											6.3										
1962	5.5											5.2										
1963	5.6											5.2										
1964	5.2											4.7										
1965	4.5	5.5										4.0	5.1									
1966	3.8	4.9										3.3	4.5									
1967	3.8	4.6										3.3	4.1									
1968	3.5	4.2										3.0	3.7									
1969	3.5	3.8										2.9	3.3									
1970	5.0	3.9	4.7									4.2	3.4	4.2								
1971	6.0	4.4	4.6									5.1	3.7	4.1								
1972	5.6	4.7	4.7									4.7	4.0	4.0								
1973	4.9	5.0	4.6									3.9	4.2	3.9								
1974	5.6	5.4	4.6									4.5	4.5	3.9								
1975	8.5	6.1	5.0	5.2								7.2	5.1	4.2	4.5							
1976	7.7	6.5	5.4	5.2								6.4	5.4	4.5	4.5							
1977	7.0	6.7	5.7	5.3								5.8	5.6	4.8	4.6							
1978	6.1	7.0	6.0	5.4								4.9	5.8	5.0	4.5							
1979	5.8	7.0	6.2	5.4								4.7	5.8	5.1	4.5							
1980	7.2	6.8	6.4	5.6	5.6							5.9	5.6	5.3	4.7	4.8						
1981	7.6	6.7	6.6	5.9	5.6							6.3	5.5	5.4	4.9	4.8						
1982	9.7	7.3	7.0	6.2	5.8							8.3	6.0	5.8	5.2	4.9						
1983	9.6	8.0	7.5	6.6	6.0							8.3	6.7	6.2	5.6	5.1						
1984	7.5	8.3	7.7	6.9	6.1							6.6	7.1	6.4	5.8	5.2						
1985	7.2	8.3	7.5	7.1	6.3	6.1						6.3	7.2	6.4	5.9	5.3	5.2					
1986	7.0	8.2	7.5	7.1	6.4	6.1						6.1	7.1	6.3	6.0	5.4	5.2					
1987	6.2	7.5	7.4	7.2	6.6	6.2						5.4	6.6	6.3	6.1	5.5	5.2					
1988	5.5	6.7	7.3	7.2	6.7	6.2						4.9	5.9	6.3	6.1	5.6	5.2					
1989	5.3	6.2	7.3	7.2	6.7	6.2						4.7	5.5	6.3	6.1	5.7	5.2					
1990	5.6	5.9	7.1	7.0	6.8	6.2	6.1					5.0	5.2	6.2	6.0	5.8	5.3	5.2				
1991	6.8	5.9	7.0	6.9	6.8	6.3	6.1					6.2	5.3	6.2	6.0	5.8	5.4	5.2				
1992	7.5	6.1	6.8	7.0	6.9	6.5	6.2					7.0	5.6	6.1	6.0	5.9	5.5	5.3				
1993	6.9	6.4	6.6	7.0	7.0	6.6	6.2					6.4	5.9	5.9	6.1	6.1	5.7	5.3				
1994	6.1	6.6	6.4	7.0	7.0	6.7	6.2					5.7	6.1	5.8	6.2	6.1	5.8	5.4				
1995	5.6	6.6	6.3	6.9	6.9	6.7	6.3	6.2				5.2	6.1	5.7	6.2	6.0	5.8	5.4	5.4			
1996	5.4	6.3	6.1	6.8	6.8	6.7	6.3	6.1				5.0	5.8	5.6	6.1	5.9	5.8	5.5	5.3			
1997	4.9	5.8	6.0	6.5	6.7	6.7	6.4	6.1				4.6	5.4	5.5	5.8	5.9	5.8	5.5	5.3			
1998	4.5	5.3	5.9	6.1	6.6	6.7	6.4	6.1				4.2	4.9	5.4	5.6	5.8	5.8	5.6	5.3			
1999	4.2	4.9	5.8	5.9	6.5	6.6	6.4	6.0				3.9	4.6	5.3	5.4	5.8	5.8	5.6	5.3			
2000	4.0	4.6	5.6	5.7	6.4	6.4	6.4	6.0	6.0			3.7	4.3	5.2	5.2	5.7	5.7	5.6	5.3	5.2		
2001	4.8	4.5	5.4	5.6	6.2	6.3	6.3	6.1	5.9			4.5	4.2	5.0	5.1	5.6	5.6	5.6	5.3	5.2		
2002	5.8	4.6	5.2	5.5	6.0	6.3	6.3	6.1	5.9			5.6	4.4	4.9	5.1	5.5	5.6	5.6	5.4	5.2		
2003	6.0	4.9	5.1	5.6	5.8	6.3	6.4	6.2	5.9			5.8	4.7	4.8	5.2	5.3	5.6	5.6	5.4	5.2		
2004	5.5	5.2	5.1	5.6	5.7	6.3	6.4	6.2	5.9			5.4	5.0	4.8	5.2	5.3	5.6	5.7	5.5	5.2		
2005	5.1	5.4	5.0	5.5	5.6	6.2	6.3	6.2	6.0	5.9		4.9	5.2	4.8	5.2	5.2	5.6	5.6	5.5	5.2	5.2	
2006	4.6	5.4	4.9	5.4	5.5	6.1	6.2	6.2	6.0	5.9		4.5	5.2	4.7	5.1	5.1	5.5	5.5	5.5	5.3	5.2	
2007	4.6	5.2	4.9	5.2	5.4	5.8	6.1	6.2	6.0	5.8		4.5	5.0	4.7	4.9	5.1	5.4	5.5	5.5	5.3	5.2	
2008	5.8	5.1	5.0	5.1	5.5	5.7	6.1	6.2	6.1	5.8		5.7	5.0	4.9	4.9	5.1	5.3	5.5	5.6	5.4	5.2	
2009	9.3	5.9	5.5	5.3	5.7	5.8	6.2	6.3	6.2	5.9		9.2	5.8	5.4	5.1	5.4	5.4	5.7	5.7	5.5	5.3	
2010	9.6	6.8	6.1	5.6	5.9	5.9	6.3	6.3	6.3	6.0	6.0	9.6	6.7	6.0	5.4	5.6	5.5	5.8	5.8	5.7	5.4	5.4
2011	9.0	7.7	6.5	5.8	6.0	5.9	6.3	6.4	6.4	6.2	6.0	9.0	7.6	6.4	5.7	5.7	5.6	5.9	5.8	5.8	5.5	5.4

5. ANNUAL TRUST FUND REAL INTEREST RATE

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5   Annual Trust Fund Real Interest Rate

5.1   Summary

For the 2013 Trustees Report, the Trustees assume ultimate real interest rates (effective annual real yields on special public debt obligations issuable to the trust funds by the U.S. Treasury) of 3.4 percent, 2.9 percent, and 2.4 percent for alternatives I, II, and III, respectively (Table 5.1). These assumptions are identical to the rates used for the 2012 Trustees Report.

Table 5.1: Assumed Ultimate Real Interest Rates

	2013 Trustees Report Alternative			2012 Trustees Report Alternative			2013 Trustees Report Less Actual 2012 Trustees Report		
	I	II	III	I	II	III	I	II	III
Real Interest Rate	3.4	2.9	2.4	3.4	2.9	2.4	0.0	0.0	0.0

Since October 1960, interest rates on special public debt obligations issuable to the trust funds each month have been set equal to the average market yield on all marketable fixed-rate Federal obligations that are not callable and do not mature within the next 4 years. As such, the rate on new issues to the trust funds represents a fair market return for longer-term, highly liquid, default-risk-free obligations. The real interest rate (real effective annual yield) on these obligations can be computed either as an expected yield (i.e., nominal effective annual yield less expected future inflation rate) or as the actual realized yield over some period after issue (i.e., nominal effective annual yield less the actual increase in price levels after issue). For the purpose of this analysis, actual realized yields over the year after issue will be examined for obligations issuable each year. Real interest rates over periods of two or more years are computed as the average annual yield of an investment at the beginning of the period that is reinvested annually at the new issue rate.

5.2   Past Experience

Tables 5.2 and 5.3 show the average annual real interest rates over various decades and economic cycles, using an adjusted CPI-W that reflects BLS improvements to the Index.[51] (See Appendix 2.1.)

The average annual real interest rate on trust fund assets over the past 40 years was 3.13 percent (computed as the average annual return, as of 2011, for investments in 1971 which were reinvested annually at the new issue rates for years 1971 through 2010). Annual real interest

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[51] Peaks in economic cycles roughly follow the NBER cycle dating, except for short recoveries such as 1980-81, which are not counted as separate cycles.

rates for individual years within this period varied substantially from this average of 3.13 percent. Even the average rates of 0.22, 6.46, 4.27, and 1.68 percent for the 10-year periods ending with 1981, 1991, 2001, and 2011, respectively, varied substantially from one another. The large differences among these periods suggest substantially different conditions across these decades.

Table 5.2: Average Annual Real Interest Rate

Period	Average Annual Real Interest Rate (percent)		
Historical:			
By Decade			
1971-1981	0.22		
1981-1991	6.46		
1991-2001	4.27		
2001-2011	1.68		
1971-2011	3.13		
1981-2011	4.12		
1991-2011	2.96		
By Complete Economic Cycle (Peak-to-Peak)			
Individual Cycle			
1966-1973	1.84		
1973-1979	-0.13		
1979-1989	5.54		
1989-2000	4.38		
2000-2007	2.19		
Last Two Cycles			
1989-2007	3.52		
Last Three Cycles			
1979-2007	4.24		
Last Four Cycles			
1973-2007	3.45		
Last Five Cycles			
1966-2007	3.17		
	Alternative		
Ultimate Assumptions	I	II	III
2012 Trustees Report (Actual)	3.4	2.9	2.4
2013 Trustees Report (Assumed)	3.4	2.9	2.4

After experiencing negative real yields in the investments in U.S. Treasury securities from 1974 through 1980, caused largely by higher-than-expected price inflation, investors demanded higher interest rates to protect their investments. Sustained high real interest rates in the years after 1981 have resulted from the following factors: constrained money supply growth, increased borrowing by businesses, reduced savings rates in the U.S. economy, deregulation of banks and other financial institutions, and lower than expected inflation in the beginning of that period.

As the rate of inflation declined from the highs of the early 1980s and remained under control, the real interest rate slowly followed suit, declining to 2.39 percent in 2000. In October 2001, the federal government, in response to its favorable budget situation, suspended the sale of 30-year Treasury securities (leaving the 10-year notes as the longest duration being issued). Since then, the budget has fallen back into deficit and, beginning in February 2006, the Treasury re-introduced regular semi-annual auctions of the 30-year nominal Treasury bond. Neither the budget deficits nor the federal funds rate hikes by the Federal Reserve between 2004 and 2006 have resulted in a spike in real interest rates, due in part to foreigners' increased willingness to accumulate Treasury securities. Instead, the real interest rate continued to trend downwards, reaching a low of 0.60 percent in 2008. After rebounding to 4.40 percent in 2009, the real interest rate fell to -0.75 percent in 2011. These swings partly reflect volatile energy prices.

5.3   Future Expectations

Over the near term, yields on Treasury securities can be expected to remain at depressed levels as long as the economy remains weak and Europe's sovereign debt crisis remains unresolved. Furthermore, the Federal Reserve, concerned about slow employment growth, recently announced that it will purchase $40 billion of additional agency mortgage-backed securities per month until it sees a "substantial" improvement in the labor market. The Federal Reserve expects that these purchases would put downward pressure on longer-term interest rates, support mortgage markets, and ultimately boost employment growth.

The realized average real interest rate over the post-1987 period is a useful indicator of the likely future rate. During this period, monetary policy was stable with few periods of inflation surprises that distort real realized rates. The CPI growth rate averaged 2.7 percent and the real interest rate averaged 3.2 percent. However, one of the fairly consistent conditions that prevailed in this period is that the federal government ran large budget deficits much of the time. These deficits put upward pressure on real interest rates during the period from the late 1980s to the early 1990s. Although the federal debt is expected to continue to grow over the short-range period, it is reasonable to believe that the Federal government would have to restore fiscal sustainability over the remainder of the long-range period. Thus, OCACT feels that an ultimate interest rate of 2.9 percent for the intermediate (alternative II) assumption is appropriate. However, if the government debt grows to a level higher than what investors are willing to absorb, then a higher real interest rate assumption would be reasonable.

5.4 Projections from Other Forecasters

Global Insight, Inc. includes projections through 2042 in its latest long-run trend forecast (see August 2012 30-year US Macro Trend Projection). They project real yields on 10-year U.S. Treasury notes to rise to 2.9 percent for 2023 through 2028 before declining to an ultimate rate of 2.7 percent in 2037 and thereafter. Moody's Analytics' August 2012 forecast projects real yields on 10-year U.S. Treasury notes to fall from 0.7 percent in 2012 to -0.2 percent in 2014 before rising to 2.9 for 2035 through 2038 and then gradually decline to an ultimate rate of 2.7 percent in 2041 and thereafter (through 2042). Macroeconomic Advisers produces forecasts to 2021 only. In its third quarter 2012 *Long-Term Economic Outlook* publication, Macroeconomic Advisers projects real yields on 10-year U.S. Treasury notes to be 2.7 percent for 2020 and 2021.

The Office of Management and Budget (OMB) Mid-Session Review of the Fiscal Year 2013 Budget projects the real yield on the trust funds' special-issue securities to reach 2.9 percent by 2021 and remain at that level for the remainder of the long-range projection period (through 2090). The Congressional Budget Office (CBO) *The 2012 Long-Term Outlook* (published June 2012) includes projections through 2087. CBO projects real yields on 10-year Treasury notes of 3.0 percent in 2068 and later. The Social Security Advisory Board's 2011 Technical Panel on Assumptions and Methods recommended lowering the alternative II real interest rate assumption to 2.7 percent. The prior technical panel, which met in 2007, recommended lowering the alternative II real interest rate assumption to 2.6 percent.

Table 5.3: Real Interest Rates for OASDI Trust Fund New Issues and the Compound Average Real Yield over Selected Intervals

To	RYINDEX	Average Annual Percentage Change over the Following Number of Years:										
		1	5	10	15	20	25	30	35	40	45	50
1961	23.27											
1962	23.97	3.03										
1963	24.63	2.74										
1964	25.33	2.81										
1965	26.02	2.73										
1966	26.42	1.56	2.57									
1967	26.97	2.08	2.38									
1968	27.37	1.49	2.13									
1969	27.72	1.27	1.83									
1970	28.28	2.00	1.68									
1971	29.18	3.18	2.00	2.29								
1972	30.01	2.85	2.16	2.27								
1973	30.02	0.04	1.86	2.00								
1974	29.17	-2.84	1.02	1.42								
1975	29.09	-0.25	0.57	1.12								
1976	29.65	1.92	0.32	1.16	1.63							
1977	29.97	1.08	-0.02	1.06	1.50							
1978	30.13	0.54	0.08	0.97	1.35							
1979	29.78	-1.18	0.42	0.72	1.09							
1980	29.33	-1.52	0.16	0.36	0.80							
1981	29.82	1.69	0.11	0.22	0.81	1.25						
1982	32.04	7.45	1.34	0.66	1.15	1.46						
1983	34.82	8.66	2.93	1.49	1.62	1.75						
1984	37.27	7.06	4.59	2.48	1.99	1.95						
1985	40.67	9.12	6.76	3.41	2.45	2.26						
1986	44.49	9.39	8.33	4.14	2.85	2.64	2.63					
1987	46.57	4.67	7.76	4.50	2.97	2.77	2.69					
1988	48.84	4.87	7.00	4.95	3.30	2.94	2.78					
1989	51.05	4.54	6.49	5.54	3.80	3.10	2.84					
1990	53.02	3.86	5.45	6.10	4.08	3.19	2.89					
1991	55.75	5.15	4.62	6.46	4.30	3.29	3.03	2.96				
1992	58.85	5.55	4.79	6.27	4.60	3.42	3.17	3.04				
1993	61.67	4.80	4.78	5.88	4.89	3.67	3.30	3.11				
1994	64.16	4.04	4.68	5.58	5.25	4.02	3.41	3.15				
1995	67.11	4.60	4.83	5.14	5.67	4.27	3.52	3.21				
1996	70.00	4.30	4.66	4.64	5.85	4.39	3.56	3.30	3.20			
1997	73.13	4.47	4.44	4.62	5.66	4.56	3.63	3.38	3.24			
1998	77.13	5.47	4.57	4.68	5.45	4.81	3.85	3.51	3.31			
1999	79.87	3.56	4.48	4.58	5.21	5.06	4.11	3.59	3.34			
2000	81.78	2.39	4.03	4.43	4.77	5.26	4.22	3.60	3.33			
2001	84.69	3.56	3.88	4.27	4.38	5.36	4.29	3.62	3.38	3.28		
2002	87.93	3.83	3.75	4.10	4.33	5.18	4.40	3.65	3.43	3.30		
2003	90.29	2.69	3.20	3.89	4.18	4.88	4.49	3.74	3.47	3.30		
2004	91.58	1.42	2.77	3.62	3.97	4.60	4.60	3.89	3.47	3.27		
2005	92.31	0.80	2.45	3.24	3.77	4.18	4.69	3.92	3.44	3.22		
2006	93.31	1.08	1.96	2.92	3.49	3.77	4.67	3.90	3.38	3.20	3.13	
2007	95.14	1.96	1.59	2.67	3.25	3.64	4.45	3.93	3.35	3.20	3.11	
2008	95.70	0.60	1.17	2.18	2.97	3.42	4.13	3.93	3.37	3.18	3.06	
2009	99.91	4.40	1.76	2.26	3.00	3.41	4.02	4.12	3.58	3.26	3.10	
2010	100.75	0.84	1.77	2.11	2.75	3.26	3.70	4.20	3.61	3.23	3.05	
2011	100.00	-0.75	1.40	1.68	2.41	2.96	3.29	4.12	3.53	3.13	3.00	2.96

Note: The index for each year is the accumulated value in that year of an investment made in the prior year in the amount of the prior year's index, with interest paid at the average rate for special public debt obligations issuable to the OASI and DI Trust Funds during the prior year.