Using the Social Security Trustees' Forecasts in the Estimation of Economic Damages

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Abstract

This paper addresses the suitability of using the Social Security Trustees' annual economic forecast to estimate the present value of future lost earnings. The forecast is assessed against four metrics: (1) the adequacy of the forecasting methodology; (2) the suitability of the forecast output for use in estimating lost earnings or calculating present values; (3) the reasonableness of the forecast output and assumptions; and (4) the validity of using the forecast output in conjunction with current interest rates.

I   Introduction

The estimation of economic damages nearly always involves the projection of future losses.

Forensic economists have approached the projection of future losses in various ways: some rely

on a historical net discount rate; some rely on a historical average discount rate combined with a

historical average growth rate; and some rely on current interest rates combined with an assumed

growth rate or growth rates. Within this last group, at least two options exist as the basis of the

assumed growth rate. First, the forensic economist may rely on a historical growth rate. Second, the forensic economist may rely on a forecasted growth rate, often obtained from a publicly available forecast such as that produced by the Congressional Budget Office (CBO) or the forecast found in the annual report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance (OASDI) trust funds.

This paper addresses the question of whether the Trustees' *Report* is suitable for the purposes of projecting future economic losses related to lost earnings or income.[1] At the outset it is important to distinguish this question from the issue of whether the forecast is suitable as a basis for drawing conclusions about the long-range financial status of the OASDI trust funds. Limitations that may exist with respect to the use of the forecast to project economic losses may have nothing to do with this latter issue. Indeed, the ultimate objective of assessing the trust funds' financial status may create requirements that are needed to meet this object but that limit the forecast's usefulness for the purpose of projecting future economic losses.

To make the ensuing discussion concrete, the losses in question will be assumed to consist of future lost earnings. Following a brief overview of the Trustees' forecasting methodology and assumptions, the suitability of the forecast is assessed against four broad metrics:

   (1) the adequacy of the basic process and forecasting methodology;

   (2) suitability of the forecast output for use in estimating lost earnings;

   (3) the reasonableness of the forecast output and assumptions;

   (4) the validity of using the forecast in conjunction with current interest rates.

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[1] The discussion below focuses on the Trustees' "intermediate" forecasts, the view they characterize as being the most likely outcome.

II   Overview of the Trustees' Forecasting Methodology

The long-range forecasts underlying the Trustees' *Report* are the result of the four process depicted in Figure 1. The primary purpose of the "Demography" process is to provide annual estimates of Social Security area population for 75-year projection period.[2] There are no linkages from any other module feeding into the demography process, although that linkages exist is recognized by the Trustees. For example, for the first 10 years of the projection period, the total fertility rate (TFR) is "assumed to increase consistent with the economic recovery where greater increases in the TFR occur in the middle of the period." (*Long-Range OASDI Projection Methodology*, p. 13). The "Economics" process projects OASDI employment and earnings-related variables, such as the average wage for indexing and the effective taxable payroll. The "Beneficiaries" process projects the fully insured and disability insured population, the number of disabled workers and their dependent beneficiaries, the number of retired workers and their dependent beneficiaries, and the number of dependent beneficiaries of deceased workers. The "Trust Fund Operations and Actuarial Status" process projects the revenue and costs flowing into and out of the trust fund operations on an annual basis for the 75-year projection period.

Only the "Demography" and "Economics" process are of interest to forensic economists in the estimation of economic damages. The main inputs and outputs for these two processes are depicted in Figure 2. Note that this figure only identifies those inputs and outputs of interest to forensic economists, and only does this at a high level. There are many other variables used and produced by these two processes, many of which are at a greatly disaggregated level. For example, many of the inputs and outputs of the "Demography" process are projected by age, sex,

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[2] The Social Security area population consists of residents of the U.S. and its territories, citizens living abroad, and beneficiaries living abroad.

and (in some instances) marital or legal status. The "Economics" process produces similarly disaggregated measures for unemployment, labor force participation, *etc*. While this level of disaggregation is necessary to project population growth and to provide the inputs needed for the remaining two processes, forensic economists will typically only be interested in the aggregate, economy-wide, measures.

The "Demography" process projects the Social Security population by age and sex cohort, using projections of fertility and death rates, and projected values of legal and other immigration. The Trustees specify ultimate values for the TFR, and for the decrease in the central death rate by sex and cause of death for five age groups. These ultimate values are assumed to be reached in year 25 of the projection period. As noted above, for the first 10 years, the TFR is assumed to increase consistent with the economic recovery; thereafter it is linearly decreased so that the ultimate value specified by the Trustees is reached in year 25. The declines in the death rate for the first 3 projected years are set equal to the average values for 21 age groups, 2 sexes and 5 causes of death, calculated based on trendlines using the last 12 years of data. For the next 21 years, the projected death rates are increased or decreased by 80 percent of the absolute difference between the prior year's value and the corresponding ultimate value specified by the Trustees.

Overall levels of legal immigration and emigration are specified by Trustee assumption. For each year these numbers are distributed by age and sex and are disaggregated between newly arrived immigrants and those who have moved from the other-immigrant population to legal permanent resident status. The process relies on the historical age-sex distribution for new

arrivals and for adjustments of status. The level of legal emigration is based on the assumption that the ratio of legal emigration to legal immigrations is 25 percent. These levels are disaggregated by age and sex based on the historical distribution of emigrants, by sex and five-year age groups.

The aggregate amount of other immigrants for each year is established by Trustee assumption. These totals are distributed based on a weighted average of the age-sex distribution of such immigrants who have and who haven't adjusted their status to legal permanent resident. The number of illegal immigrants, as well as legal immigrants who are admitted for a limited period of time, is projected along with the number of such immigrants who leave the Social Security area for another locations, or whose status changes to legal permanent resident.

The "Economics" process projects OASDI employment and earnings-related variables, such as the average wage for indexing. The process is composed of four subprocesses: (1) "U.S. Employment" (USEMP); (2) "U.S. Earnings" (USEARN); (3) "Covered Employment and Earnings" (COV); and (4) "Taxable Payroll".   Only the first three of these subprocesses are of interest to forensic economists: USEMP projects U.S. employment; USEARN projects earnings data; and COV projects total covered employment and, ultimately, the average wage index. Additionally, COV and the last subprocess convert the outputs of USEMP and USEARN into OASDI covered concepts and to taxable concepts used to estimate future payroll tax income and future benefit payments.

The "Demography" process produces projections for the entire Social Security area population (P), defined as all persons who are potentially eligible to receive benefits under the Social Security program or who have the potential to work in covered employment. USEMP relies on the civilian non-institutional population from the Current Population Survey (N), along with the civilian labor force (LF) and its two subcomponents, total employed (E) and total unemployed (U). Additionally, USEMP produces forecasts of the U.S. military population (M).

The projected values of M and N are generated by assuming: (1) that M remains constant for the first 10 years of the projection period and grows at the same rate as E thereafter; and (2) that the sum of N and M grow at the same rate as P. These assumptions can be expressed algebraically as:

$$M_t = \text{constant for } t \leq 10 \tag{1}$$
$$M_t = M_{t-1} \cdot (E_t/E_{t-1}) \ \text{ for } t > 10 \tag{2}$$
$$N_t = (N_{t-1} + M_{t-1}) \cdot (P_t/P_{t-1}) - M_t \tag{3}$$

The total labor force and total employed are given by

$$LF_t = LFPR_t \cdot N_t \tag{4}$$
$$E_t = LF_t \cdot (1 - RU_t) \tag{5} \ \text{ where}$$

RU is the unemployment rate and LFPR is the labor force participation rate.

The ultimate values of RU are specified by Trustee assumption and are assumed to be reached during the last half of the short-range (*i.e.*, the first 10 years) projection period. The earlier values in the projection period are also set by Trustee assumption to provide a smooth transition from the last historical value. Note that the assumed values of the unemployment rate are age-

and sex-adjusted based on the 2010 age-sex distribution of the civilian labor force. This differs from the published headline unemployment rate; the average adjusted rate is less than the average published rate for each of the last 5 business cycles. These economy-wide values of RU are disaggregated by sex and age based on a set of 28 regression equations and on a set of adjustment factors designed to constrain the component parts to the overall assumed aggregate values. The regression equations specify the change in each RU subcomponent as a distributed lag of the ratio of actual to potential GDP. The value of RU used in (5) is a re-aggregation of these disaggregated values.

The detailed projections of RU are also inputs to a bottom-up process that produces projected values of LFPR. This process consists of 153 equations that produce disaggregated estimates of labor force participation rates by age and gender. Of these equations, only 28 are estimated equations; the rest are identities that allocate the LFPRs to individual ages based on assumed relationships or that aggregate the LFPRs to a higher level. The estimated equations express the LFPRs as functions of distributed lags of the corresponding RUs, and as functions of variables such as the proportion of the population receiving disability benefits, changes in life expectancy, or the LFPR of spouses.

USEAR disaggregates the projected value E into three subcomponents: (1) wage and salary workers (EW); (2) the self-employed (ES); and (3) unpaid family workers (EU). EW and ES are determined by identities:

$$EW_t = E_t - ES_t - EU_t \qquad \text{(6) and}$$
$$ES_t = SEPR_t \cdot E_t \qquad \text{(7) where}$$

SEPR$_t$ is the self-employed participation rate in year t, defined as ES$_t$/E$_t$. Both SEPR$_t$ and EU$_t$ are based on disaggregated estimates of each variable. The SEPRs are disaggregated by age, sex, marital status and industry (agricultural and non-agricultural) based on regression equations that express each disaggregated variable as a distributed lag of the unemployment rate for the corresponding age and sex. EU is disaggregated by age and gender. The number of unpaid agricultural family workers is set to a constant amount for each age and gender. The number of unpaid non-agricultural family workers by age and gender is set to a constant proportion of total non-agricultural self-employed workers. (Presumably, these constant amounts and proportions are based on some historical average.)

USEMP sets the growth in real GDP equal to the sum of the projected growth rate in E (including the military), and the assumed growth in productivity and average hours worked. Potential GDP is calculated in the same fashion, by solving USEMP for E under full-employment conditions. Note that because the Trustees' ultimate (full-employment) assumed value for unemployment is reached in year 7, the ratio of real GDP to potential GDP reaches one fairly quickly. Nominal GDP is calculated as the product of real GDP and the GDP deflator. The growth rate in the deflator is set by Trustee assumption.

USEAR projects WSSY, the sum of total wage worker compensation (WSS) and proprietors' income (Y), as a proportion of nominal GDP. WSSY is broken into WSS and Y by estimating Y as a proportion of the total. Similarly, the wage and salary disbursements (WSD) portion of WSS is estimated as a proportion of the total. These relationships are expressed algebraically as:

$$WSSY_t = RWSSY_t \cdot GDP_t \qquad\qquad (8)$$

$$Y_t = RY_t \cdot WSSY_t \qquad\qquad (9)$$

$$WSS_t = WSSY_t - Y_t \qquad\qquad (10)$$

$$WSD_t = RWSD_t \cdot WSS_t \qquad\qquad (11) \quad \text{where}$$

RWSSY is the ratio of WSSY to GDP; RY is the ratio of Y to WSSY; and where RWSD is the ratio of WSD to WSS. The ultimate growth in the RWSSY ratio is set by Trustee assumption; for the first 10 years it is based on projections of WSS, WSD and Y disaggregated by sector (farm, government and government enterprises, households, non-profit institutions, and private nonfarm business excluding government enterprises.) The resulting values of RWSSY are smoothed to provide an even transition to the ultimate values. RY is based on separate projections of Y disaggregated into the farm and private nonfarm business excluding government enterprises sectors. RWSD is set by assumption and is assumed to decline over the 75-year projection period.

As noted above, COV converts the output of USEMP and USEARN to OASDI covered concepts. Additionally, it computes the average wage of all wage and salary workers (ACWC) by dividing WSD by total covered and non-covered wage and salary workers. The growth in ACWC is used to project the average wage index used in the calculation of Social Security benefits.

III   Adequacy of the Basic Process and Forecasting Methodology

The foregoing summary makes it clear that the economic forecast found in the Trustees' *Report* is largely the result of their assumed values for unemployment, inflation and the growth in productivity and average hours worked. The projected values of employment are determined by

a tops-down disaggregation of the assumed unemployment rate by age and gender, and a bottom-up aggregation of labor force participation rates. Both the top-down and the bottom-up processes are based on regression equations that relate the dependent variable (*i.e.*, unemployment and labor force participation rates by age and gender) to measures relating to the amount of slack in the economy. In the case of the top-down process that disaggregates the assumed unemployment levels this measure is based on ratio of actual to potential GDP. As noted earlier, this ratio rapidly converges to one in the last half of the short-range projection period. The equations underlying the bottom-up process that aggregates labor force participation specify the dependent variable as a distributed lag of the corresponding unemployment rate, plus other variables such as the proportion of the population receiving disability benefits or changes in life expectancy. Both sets of these estimated equations suffer from some econometric problems, ranging from very low R-squared estimates to coefficients that are not statistically different from zero. Additionally, the estimation process does not take into account the simultaneity of the system into account. Moreover, even though the labor force projections are based on estimated relationships, those relationships do not take into account the effect of extended periods of unemployment on labor force participation. Finally, although the Trustees specify assumptions for real wage growth and real interest rates, these variables do not enter into the forecast of (real or nominal) GDP, of employment, or of the average wage index: they are only used to determine status of the trust funds and the expected level of benefits by age cohort. Nevertheless, the forecasted real wage growth derived from the projected values of the average wage index and the adjusted CPI-W track the assumed values of the real wage differential very closely. This suggests that specification of the assumed values for inflation and for real wage growth is not performed independently.

The fact that the Trustees' forecast is driven substantially by assumption rather than behavioral relationships is some cause for concern. For example, the assumption that the number of military personnel remains constant is not only contrary to announced plans in the May 2013 DOD budget request for fiscal year 2014, it also ignores the impact of a smaller military on civilian employment levels. Likewise, the assumption that full employment is reached in year 7 of the plan may be unwarranted: in spite of unprecedented monetary stimulus since the Great Recession, at the time of the forecast total employment remained substantially below its pre-recession level.[3]

Again, these shortcomings likely have minimal impact on the long-range financial status of the trust funds over a 75-year horizon. However, earning losses are typically projected for much shorter time periods, so that the near-term forecast variance may have a substantial impact.

IV   Suitability of the Forecast Output for Use in Estimating Lost Earnings

Of all the variables that are either specified by assumption or produced by the forecast process, only three offer hope of being useful in the valuation of lost earnings: (1) projected inflation rates; (2) projected interest rates (both real and nominal); and (3) projected wage growth (both real and nominal). For example, a forecast of expected inflation might be used to deflate lost pension amounts that remain unchanged if future losses are discounted to the present using a real discount rate. Likewise, some forensic economists might use the Trustees' projected interest rates as a basis for discounting. Finally, the projected growth in the average wage index might be used to project nominal future lost earnings. In conjunction with the inflation forecast, the average wage index forecast might also be used to derive projected real wage growth.

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[3] This is true today – as of September 2013, there are 1.66 million fewer jobs than existed in November 2007.

With respect to the Trustees' inflation forecast, it is important to realize that they are projecting

the growth in an adjusted version of the CPI-W (the CPI for Urban Wage Earners and Clerical

Workers), rather than the CPI-U (the CPI for All Urban Consumers).[4] Although the paths of the

two indexes move roughly in tandem, there are differences in the yearly inflation levels. On

average, inflation measured by the CPI-U is 5.0 basis points greater than inflation measured by

the adjusted CPI-W, although there have been years when the difference is much greater – see

Figure 3.

The historical and forecasted values for nominal and real interest rates are shown in Figure 4.

These interest rates reflect the nominal and realized real interest rate on the special public debt

obligations issued to the trust funds by the U.S. Treasury. The forecasts of real rates are

specified by Trustee assumption; the forecasts of the nominal rates equal the real rate plus

forecasted inflation in the adjusted CPI-W.

It is not clear what average maturity corresponds to the SSA long-term rates. Documentation on

Trust fund investment practices states:

> The maturity dates of newly issued special issues are set by a standardized
> procedure. Revenues are invested immediately in short-term issues called
> certificates of indebtedness, which mature on June 30 of each year. On June 30,
> certificates of indebtedness that have not been redeemed are reinvested in longer-
> term special issue bonds. The maturities of these bonds range from 1 to 15
> years—the goal is to have about one-fifteenth of them mature each year. This
> means that the average maturity of these long-term bonds is about 7½ years.
> (Nuschler, 2010)

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[4] The Trustees also project the increase in the GDP inflator. However, the forecasted inflation rate is set at a fixed
differential below the CPI-W forecast. For the intermediate view, this differential is 40 basis points. For the low-
cost and high-cost views, the differential is 30 and 50 basis points, respectively.

However, the Trustees' documentation of their long-range economic assumptions states:

> 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. (*The Long-Range Economic Assumptions for the 2013 Trustees Report*, Office of the Chief Actuary, SSA)

A comparison of the historical nominal data with the yields on 7-, 10- and 20-year Treasury bonds indicates that the long-term SSA rates track the 7- and 10-year maturities closely, and are generally below the 20-year yields. (See Figure 5). Whatever the average maturity is, that maturity is not a reason to exclude use of the SSA long-term interest rates in the estimation of damage estimates.

The growth in the Trustees' forecast of the average wage index is an obvious basis for projecting future lost earnings. Even though the index is used in the calculation of the benefits paid to all covered workers, including the self-employed, the underlying data reflect wage and salary earnings only. Prior to 1978, the index was based on first-quarter earnings per employee reported to the Social Security Administration. From 1978 through 1984, the source data were annual earnings per employee obtained from the Internal Revenue Service, and only included the wage and salary earnings of individuals who filed a tax return. From 1985 on, the data are based on Social Security Administration's own analysis of W-2s, and consequently included the wage and salary earnings of individuals whether or not they filed a tax return. This change had the effect of decreasing the calculated average wage, since the earnings of low-income workers previously excluded from analysis were now included. Finally, the "Omnibus Budget Reconciliation Act of 1989" amended the calculation of the average wage amounts for 1991 and

subsequent years by including contributions to certain deferred-compensation plans. At least initially, this change had the effect of increasing the average wage index.

While these definitional changes do not preclude use of the average wage index as a basis for projecting future earnings losses, there is a significant difference between its historical growth and the growth in other earnings measures. This can be seen in Figure 6, which compares the average wage index with the average weekly earnings of production and nonsupervisory employees and with the wage and salary Employer Cost Index of all private industry employees. Figure 6 shows that the growth in the average wage index has not been as smooth as in the other two measures; this may be due the definitional changes noted above. Differences in the average growth rates in these three measures for various time periods appear in the following table:

Table 1: Average Growth in Various Earnings Measures
(Periods Ending in 2012)

Time Period (Years)	Average Wage Index	Private Industry Wage & Salary ECI	Average Weekly Earnings
30	3.74%	3.24%	3.01%
25	3.52%	3.07%	3.00%
20	3.28%	2.89%	3.00%
15	2.36%	2.11%	2.19%
10	2.77%	2.39%	2.76%
5	1.59%	1.92%	2.47%

As can be seen in the above table, the growth in the average wage index has consistently exceeded the other two measures, except for the last 5-year period. It is not clear why this is the case, although the inclusion of all sources of wage and salary earnings (including a second, part-time, job) in the average wage index may be a factor.

Finally, because the present value of lost earnings ultimately depends on both the growth rate used to project future earnings and the interest rate used to discount the projected earnings to the present, it is useful to examine both the historical net discount rate derived from the trust fund interest rates and the growth in the average wage index and the implied future net discount rate based on the Trustees' forecast of the underlying components. This is done in Figure 7. It is clear that the resulting net discount rate exhibits a pronounced downward trend starting in the early eighties and is not stationary. This feature alone precludes the combined use of the Trustees' forecasts of interest rates and wage growth to estimate the present value of future lost earnings.

V   The Reasonableness of the Forecast Output and Assumptions

The reasonableness of the Trustees' forecasts can be assessed in a variety of ways: (1) by comparing them to forecasts from other sources or derived from market data; (2) by comparing the forecasted and historical values; and (3) by examining the rationale given for the adoption of an assumed ultimate value.

Comparison to Other Forecasts

The ability to compare the Trustees' forecasts to other forecasts is limited by the degree of overlap in terms of forecast horizon and variables forecast. Three potential comparison forecasts are available: (1) the February 2013 economic outlook published by the CBO; (2) the May 10, 2013 *Survey of Professional Forecasters* published by the Federal Reserve Bank of Philadelphia; and, to a lesser extent, (3) the May 2013 *Wall Street Journal* economic forecasting survey.

A comparison of the unemployment rate and real GDP forecasts appears in Figure 8. Not shown in the first panel is the unemployment rate forecast from the *Wall Street Journal* survey – it is on average 0.2 percentage points lower than the *Survey of Professional Forecasters.* Not shown in the lower panel is the real GDP forecast from the *Wall Street Journal* survey. For 2013, it is slightly higher than the *Survey of Professional Forecasters.* The two forecasts coincide for 2014 and 2015.

Compared to the CBO forecast, the Trustees project slightly higher unemployment and slower real GDP growth. The trajectory of real growth differs: the Trustees' forecast reaches a peak in 2015 and declines thereafter, while the CBO's forecast peaks a year later and declines more sharply. Both the Trustees and the CBO project higher real growth than either of the two private forecasts. Paradoxically, the two private forecasts project both <u>lower</u> unemployment and <u>lower</u> real growth near term (out to 2015 or 2016). This may reflect an expectation of continued declines in labor force participation that causes the headline unemployment rate to drop even though economic growth remains subdued.

A comparison of the Trustees' 5- and 10-year CPI inflation forecasts with those of the CBO and the *Survey of Professional Forecasters* appears below:

Table 2: Comparison of CPI Inflation Forecasts

Period	Trustees	CBO	*Survey*
2013-2017	2.46%	2.07%	2.20%
2013-2022	2.65%	2.20%	2.30%

Even after accounting for differences between the CPI-W and CPI-U, it is clear that the Trustees expect higher inflation on average than do other forecasters.

Besides comparing the Trustees' inflation forecast to others, it is possible to compare it to the market's expected inflation as of the date the Trustees' forecast was issued, where expected inflation equals the geometric difference between nominal U.S. Treasury bonds and Treasury Inflation Protected Securities (TIPS) at various maturities or time horizons. This is done below for horizons of 5, 7, 10, 20 and 30 years:

Table 3: Comparison of CPI Inflation Forecast at Various Time Horizons With a Market-Derived Measure of Expected Inflation

Forecast Horizon	May 31, 2013 Treasury Yields		Expected Inflation	Trustees' Inflation Forecast
	Nominal	TIPS		
5	1.05%	-0.82%	1.89%	2.53%
7	1.55%	-0.38%	1.94%	2.61%
10	2.16%	-0.05%	2.21%	2.67%
20	2.95%	0.63%	2.31%	2.73%
30	3.30%	0.97%	2.31%	2.76%

Again, the Trustees have projected higher inflation, with the difference being even greater than the comparison with other forecasts suggests.

Finally, it is possible to use the 10-, 20- and 30-year TIPS yields to evaluate the Trustees' forecast of the real long-term interest rate. A -0.05 percent 10-year yield, combined with a 0.63 percent 20-year yield today, implies a 10-year yield of roughly 0.68 percent ten years hence. Similarly, the 20- and 30-year yield implies a 10-year yield of roughly 0.34 percent in 20 years time. The Trustees have forecast a much higher real rate of 2.9 percent for both 2023 and 2033.

One plausible rational for this variance is that the Trustees are forecasting much higher real economic growth than the market currently expects. This does not appear to be the case, since after reach a peak of 4.0 percent in 2015, the Trustees' forecast of real GDP growth declines to the 2.0 to 2.1 percent range by 2022. Alternatively, it could be that Federal Reserve's then-

existing bond-buying policy had artificially depressed yields to such an extent that they would be more than 200 basis points higher at the long end of the yield curve in the absence of the purchases. This hardly seems credible.

Comparison to Historical Values

The near-term rebound in real GDP growth contemplated by the Trustees shows up in the proportion of the population that is employed and in the forecast for real wage growth. The top panel of Figure 9 shows the long view of the covered workers as a proportion of the SSA population age 20 and over. The lower panel shows the same measure from 1990 through 2040. It is clear that this measure has been on a downward trend since 2000, and that the Trustees expect this to continue over the long term until it begins to level off starting in 2030. Presumably, this decline is due to demographic forces – *i.e.*, the aging of the baby boom generation born between 1946 and 1964. However, the sharp drop from the 2007 level is cyclical and likely reflects the impact of the Great Recession on labor force participation rates. Whether labor force participation, and the employment measure in Figure 9, recovers, is a question that has no easy answer. It clearly depends on the pace of economic growth through 2018 which in turns depends on the level of employment and labor force participation.

The Trustees' expectation for higher real economic growth in the 2014-2020 time period shows up in their forecast for real wage growth. Figure 10 shows the historical and forecasted real growth in the average wage index from 1995 through 2025. After a general downward trend from 1998 through 2012, the Trustees project real wage growth rebounding to 3 percent and subsequently declining to roughly 1 percent in 2022 and thereafter.

The ultimate values of greater than 1 percent real wage growth are at odds with the prior 47-year history for the deflated (by the adjusted CPI-W) average wage index. This is shown in Figure 11: the historical trendline growth rate equals 0.56 percent; the forecasted growth of 1.12 percent is twice the historical average. Figure 12 shows the historical and forecasted real average wage index based on the GDP deflator.[5] The historical and forecast growth rates increase to 1.09 and 1.51 percent, respectively; the forecast real growth is still substantially above the historical average. Both the near-term (*i.e.*, through 2022) and the long-term forecast of real wage growth calls the suitability of the use of the Trustees' forecast by forensic economists into question.

The Rationale Given for the Adoption of the Trustees'
Assumed Ultimate Values

As noted earlier, the Trustees specify the ultimate assumed values for the following five variables: (1) productivity; (2) price inflation; (3) the average real wage differential; (4) the unemployment rate; and (5) the average trust fund real interest rate. A summary of the rationale underlying the ultimate assumptions is presented in the *Appendix* below. In general, the discussion of the rationale underlying each ultimate assumed value covers a review of the historical experience, some discussion of factors that may affect the future, and a comparison with three private and two public forecasts.[6]

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[5] Note that the Trustees assume that nominal earnings will increase at the same rate as the GDP deflator, but measure real wage growth based on the CPI-W. Since many, if not most, forensic economists, estimate expected inflation on the basis of the difference between nominal Treasury bonds and TIPS (and, hence, on the basis of the CPI-U), Figure 11 is the most relevant representation of historical and forecasted real wage growth.

[6] The private forecasts are produced by Global Insights, Macroeconomic Advisers, and Moody's Analytics. Two public forecasts are also used as comparison benchmarks: the Office of Management and Budget's (OMB) mid-session review of the fiscal year 2013 budget and the CBO's June 2012 report, *The 2012 Long-Term Budget Outlook*. Note that not all of the private forecasts extend out to 2090. The OMB and CBO forecasts extend to 2090 and 2087, respectively. The 2087 forecast horizon may be why the June 2012 report was used as a benchmark rather than the CBO's February 2013 forecast.

On the surface, the rationale summarized in the *Appendix* and the comparison to private and public forecasts create the impression that the Trustees' underlying ultimate assumptions are reasonable. However, there are several flaws that suggest the forecast may be too optimistic or based on incorrect logic.

First, the Trustees have relied on historical growth benchmarks based on the compound growth between the start and end of the selected period; this approach ignores the path of the variable in question over the intervening years. As noted in the *Appendix*, this overstates the Trustees' historical benchmark for productivity by 10 to 15 basis points. Similarly, the Trustees' inflation benchmark is overstated by 20 basis points.

Second, the Trustees have assumed that the compensation ratio – total compensation divided by GDP – will remain unchanged. This contradicts the history in the U.S. of a declining share of income over the last 25 years. (See Elsby, *et al.*, 2013). Moreover, it is inconsistent with the 1.12 percent real growth in the average earnings index projected by the Trustees: if real wages were to grow at twice the historical rate, firms would have even greater incentive to replace labor with capital than they have in the past. Indeed, the assumption of no change in the compensation ratio may be the reason why the Trustees' assumptions result in such a high real growth rate for the average wage index.

Third, while higher-than average increases in medical costs will increase *measured* inflation in the short term, a change in relative prices cannot be a source of a permanent increase in the inflation rate. The real price of oil, a commodity used in all sectors of the economy, has

increased at an annual rate of 0.8 percent since 1970, yet the rate of inflation has decreased

significantly since then.   The Trustees also claim that increased federal deficits in the late

eighties and early nineties led to upward pressure on real interest rates. They assume that over

the long-term, the federal government will restore fiscal sustainability and cite this as a reason

for their ultimate assumed value of a 2.9 percent real rate. Even if true, this logic does not make

sense since the 2.9 percent is an increase in the real rate compared to current levels and to the

2000-to-2007 average.   (See Table A1 in the *Appendix*.)   If increased deficits put upward

pressure on real rates, the assumed restoration of fiscal sustainability (*i.e*., lower deficits), is not

consistent with a projected increase in real rates. Moreover, the claim that increased deficits put

upward pressure on rates does not withstand scrutiny – the real trust fund rate declined in the late

eighties and early nineties as shown in the table below:

Table 4: Real Trust Fund Interest Rate, 1986 to 1994

Year	Real Trust Fund Rate	Change in Basis Points	Cumulative Change
1986	9.3	30	30
1987	4.4	-490	-460
1988	4.4	0	-460
1989	4.0	-40	-500
1990	3.4	-60	-560
1991	4.5	110	-450
1992	5.1	60	-390
1993	4.3	-80	-470
1994	3.6	-70	-540

Finally, the Trustees' rationale for their assumed ultimate value for the real interest rate ignores

the linkage between real rates and economic growth.   In the long-term, real interests are

determined by the expected return to capital investments, which in turn is closely related to the

underlying strength of the economy. (See, for example, Bernanke, 2013.) The Trustees make no

mention of this. Moreover, their ultimate value of 2.9 percent seems to out of synch with

expectation for long-term real GDP growth in the 2.0 to 2.2 percent range. For the last three business cycles, real GDP was higher than this, as was the trust funds' real interest rate. As shown below, the rate dropped in the last cycle, as did real growth:

Table 5: Real Trust Fund Interest Rate and Trendline Growth in Real GDP

	Real Rate	Real Growth
1979-1989	5.54	3.36
1989-2000	4.38	3.37
2000-2007	2.19	2.55

History suggests that the real rate should decline below 2.2 percent if real economic growth is expected to be below that experienced in the 2000-to-2007 period.

In sum, the Trustees have forecast higher inflation and higher real interest rates than either the (then-current) private forecasts or the February 2013 CBO forecast, as well as projecting higher values than those derived from the market rates at the time the Trustees' *Report* was issued. The Trustees have also projected a sharp economic recovery in 2014, implying an increase in employment and labor force participation that is yet to be realized. More important, the Trustees' projection of the real growth in the average wage index is substantially greater than the historical trend. This is likely due to the assumption that the compensations ratio will remain unchanged and to the Trustees' focus on future growth in aggregate real earnings. (See the *Appendix*.) Finally, the rationale given for the assumed ultimate values suffers from several flaws, most notably a misunderstanding of the impact of a change in relative prices on inflation and turning a blind eye to the linkage between real rates and real economic growth.

VI **The Validity of Using the Forecast in Conjunction with Current Interest Rates**

As noted at the start of the paper, one approach to estimating the present value of future losses is to rely on current interest rates to discount the losses to the present in conjunction with either a historical or forecast growth rate to project the losses into the future. Both of these approaches will lead to a disconnect between the interest rate used for discounting and the growth rate used to project future earnings.

Consider first the use of current interest rates in conjunction with an average historical growth rate. Clearly, if the calculations are based on a nominal current interest rate and average growth in nominal wages, there is a disconnect: the historical growth rate will include the effect of past inflation which is likely to be substantially higher than the expected inflation embodied in current interest rates. And, if the analysis is done using current real rates and average real historical growth, the disconnect will likely still exist. Current real interest rates reflect expectations about future real economic growth – these expectations are unobservable and will only equal the historical average by chance,

For much the same reason, a disconnect exists between the use of current interest rates and a forecasted growth rate obtained from either a private or public forecast. We have already seen that the Trustees' inflation forecast differed from that implied by market rates on the day it was issued. (Refer again to Table 3.) This is not unique to the Trustees' *Report*. The table below presents a similar comparison for the October 4, 2013 CPI inflation forecast produced by Moody's Analytics:

Table 6: Comparison of Moody's CPI Inflation Forecast at Various Time Horizons With a Market-Derived Measure of Expected Inflation

Forecast Horizon	October 4, 2013 Treasury Yields		Expected Inflation	Moodys' Inflation Forecast
	Nominal	TIPS		
5	1.41%	-0.38%	1.80%	2.35%
7	2.05%	0.14%	1.91%	2.30%
10	2.66%	0.46%	2.19%	2.24%
20	3.43%	1.08%	2.32%	2.15%
30	3.73%	1.40%	2.30%	3.20%

Like the Trustees' *Report*, the Moody's forecast is out of synch with the current market expectations embodied in current interest rates.

Additionally, like the Trustees' *Report*, all forecasts are stale on the date they are published and become more out of synch and stale as time passes. For example, even though the Trustees' *Report* was published on May 31, 2013, the assumptions had all been selected by the end of 2012. (See page 77 of the *Report*.) This staleness problem is a more significant issue with forecasts like the Trustees' *Report* or the CBO forecast which are updated only one or two times a year, since private forecasts are issued more frequently. For example, Moody's Analytics updates their forecast monthly, ostensibly mitigating the problems that occur with the passage of time.

Nevertheless, it is impossible for the Trustees' *Report*, or any other public or private forecast, to account for all of the information reflected in current interest rates. And, even if the information set were identical, there is no reason to believe that it was given the same weight as assigned by the market. For this reason, use of the Trustees' *Report* or any other forecast as a source of growth rates to be used in conjunction with the current market interest rates founders.

VII   **Summary and Conclusion**

While the processes underlying the Trustees' forecast are complex, most of that complexity is focused on providing forecast details at levels of disaggregation needed to project the revenue and costs flowing into and out of the trust fund operations. Consequently, forensic economists are relatively unconcerned by those aspects of the forecasting methodology. An exception to this is the top/down and bottom/up processes used to disaggregate and re-aggregate the unemployment rate and labor force participation rate forecasts. Even so, judgment, via the application of "add-factors" plays a large part in the final projections, just as it does in the specification of the assumed ultimate values for productivity, inflation, *etc*.[7]

There are three variables produced by the Trustees' forecasts that are of primary interest to forensic economists: inflation, interest rates and wage growth. In addition, forensic economists are, or should be, interested in the projected values for unemployment and real GDP, since these variables can be used to assess the reliability or accuracy of the forecast. Whereas forensic economists will typically rely on the CPI-U, the Trustees' basic measure of inflation is based on the CPI-W. On average, inflation measured by the CPI-U is about 5.0 basis points greater. The Trustees forecast the average real and nominal long-term trust fund interest rate by specifying the real rate and deriving the nominal based on the projected change in the CPI-W. The maturity corresponding to these interest rates varies, but seems to fall in the 7- to 10-year range. Forensic economists would likely rely on the projected values of the average wage index to derive either a nominal or real rate of wage growth. If so, they should be aware that this measure has grown at a faster rate than other wage measures based on the ECI or on average weekly earnings. Finally,

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[7] The use of add-factors to adjust modeled results is not limited to the Trustees' methodology; it is common in many commercially produced forecasts.

while it might be tempting to use both the Trustees' forecasted interest rates and wage growth to calculate the present value of lost earnings, the resulting net discount rate is clearly not stationary. This precludes using both forecasts in combination.

The Trustees' forecast for inflation is generally greater than those of other private forecasters at the time the Trustees' *Report* was published. It is also greater than the expected inflation measured by the difference between nominal Treasury yields and TIPS rates. Similarly, the Trustees' near-term (2014 and 2015) forecast for real growth exceeds that of private forecasters. This projection of faster near-term growth seems to rely on a recovery in employment and in the labor force participation rate that is yet to make itself evident. While these near-term variances are more troubling to forensic economists than to the Trustees, the Trustees' projection of long-term real growth in the average wage index is suspect: the forecasted trendline real growth of 1.12 percent is twice that of the historical trend.

One reason for this discrepancy may be that the Trustees are evaluating their assumed real wage differential based on the historical real growth in average earnings; this appears to be a total-economy concept rather than a per-worker measure that forensic economists are most interested in. Also, the Trustees have assumed that labor's share of national income will not change, even though it has declined over the last 25 years.

The Trustees' forecast rationale suffers from other shortcomings: (1) their benchmarks for historical productivity growth and inflation are overstated; (2) they attribute their view for higher inflation to a change in the relative price of medical services; and (3) they wrongly attribute

upward pressure on real rates with increased federal deficits and then project an increase in real rates while assuming restoration of fiscal sustainability at the federal level. More significant than these shortcomings is that the Trustees do not consider the link between real rates and the return on capital and expectations for economic growth. They inconsistently project an increase in real rates from current levels that is greater than the average over the last complete business cycle, while simultaneously projecting real GDP growth much lower than historical norms.

All of the above deals either with the specifics of the Trustees' intermediate forecasts in their 2013 *Report*, or with their underlying methodology. There is another reason why their forecast, or any forecast, cannot be used by forensic economists to estimate the present value of future lost earnings. Financial markets are forward-looking and today's current interest rates reflect expectations of future inflation and future real growth. Using historical growth rates in conjunction with current interest rates will almost certainly result in a disconnect: the historical inflation and real growth embodied in past averages will only be consistent with today's expectations by chance.

Similarly, it is unlikely that the forecasted growth and inflation rates obtained from public or private forecasts will be consistent with today's market expectations. Such forecasts are issued at discrete intervals while market expectations are updated constantly. Consequently, it is not possible for a forecast to consider all of the information reflected in market rates. As demonstrated above, both the Trustees' inflation forecast and that of Moody's Analytics differed significantly from market expectations on the day they were issued. Finally, even if the two information sets were identical, there is no reason to believe that the forecasters will assign each

element the same weight as does the market: a forecast represents but one opinion of an individual or a small group of individuals whose motivation and objectives influence their judgment. Market expectations reflect the assessment of a large number of market participants, motivated primarily by one thing: profit. This doesn't mean that the market expectations will be correct, but it does imply that they will be different than the private or public forecasts. Using forecasted growth rates in conjunction with current interest rates requires the forensic economist to accept an inherent inconsistency or, worse, deny the link between current rates and expectations for inflation and growth.

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Appendix

Summary of the Rationale Underlying the
Trustees' Ultimate Assumptions

This appendix summarizes the Trustees' rationale for their ultimate assumed values for (1) productivity; (2) price inflation; (3) the average real wage differential; (4) the unemployment rate; and (5) the average trust fund real interest rate.

Productivity

The assumed ultimate value for productivity is 1.68 percent – very close to its 1961-to-2011 trendline growth of 1.67 percent. Note that the Trustees calculate average growth over this period as 1.82 percent, based on the compound growth between the starting and ending years. They also cite the 1.68 growth over the last five complete business cycles (from 1966 to 2007), calculated in the same way. The trendline growth over this period is 1.58 percent.

Ostensibly, the Trustees' 1.68 percent assumed value is a weighted average of assumed productivity growth in the five sectors noted earlier (farm, government and government enterprises, households, non-profit institutions, and private nonfarm business excluding government enterprises.) These assumed productivity rates are 2.03, 0, 0, 0 and 2.03 percent, respectively. The Trustees have assumed that large corporate farms will dominate agriculture in the long-term, and that productivity growth will match that of the nonfarm business sector. The 2.03 percent rate assumed for the nonfarm business sector is slightly above the 1.92 percent calculated over the last 5 business cycles; the higher assumed rate is justified on the basis that productivity growth in the 1973 to 1995 period was adversely affected by the "shift in employment from relatively high-productivity manufacturing jobs to low-productivity service

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jobs, and to the influx of new unskilled baby-boomers into the workforce." (*Long-Range Economic Assumptions of the 2013 Trustees Report*, May 31, 2013, page 5 of the Productivity section). The zero rates of productivity growth for the government and nonprofit institutions sectors are cited as being comparable to their 1986 to 2011 growth rates of 0.04 and 0.06 percent, respectively. The rationale for the zero growth in the household sector is not clearly articulated. However, because this sector represents about 2 percent of (measured) economic output, the assumed value has little impact on the resulting overall productivity growth.

With respect to the private comparison forecasts, the Trustees' assumed values for the nonfarm business sector and for overall productivity are consistent with Global Insights and Macroeconomic Advisers. Their values exceed the forecasts of Moody's Analytics by 30 to 20 basis points. The Trustees' overall productivity growth is in line with the OMB and CBO projections.

Inflation

The Trustees' assumed ultimate value for (CPI-W) inflation is 2.80 percent. In explaining the 2.80 percent assumption, the Trustees cite the 2.63 percent average rate over the last two business cycles (1989 to 2007). Again, this value is calculated based on the compound growth between the start and end of the period; the trendline growth rate equals 2.43 percent. The higher-than-historical forecast is justified by the belief that monetary policy may not be able to fully prevent occasional bursts of inflation caused by demand and supply shocks even though it will continue to target relatively low inflation. Higher-than-average medical cost inflation, coupled with a rising ratio of health expenditures to total consumer expenditures, is also cited as justification for the 2.80 forecasted value.

The Trustees have set the assumed value for inflation measured by the GDP deflator a fixed 40 basis points lower than that for the CPI-W at 2.40 percent. They attribute this differential to differences in coverage and computational methods. They also cite the differences over the average differential for 1979 to 1989 (-28 basis points), 1989 to 2000 (-39 basis points), and for 2000 to 2007 (-4 basis points). The Trustees characterize this last period as an aberration caused by unusually high growth in military pay (including basic military pay, reenlistment bonuses, and other types of incentive pay) during this period that is not likely to reoccur.

With respect to the private comparison forecasts, the Trustees' assumed values are higher for both CPI and GDP deflator inflation; the Trustees' differential is greater by about 20 basis points. The Trustees' inflation projections are also greater than the OMB's and CBO's; the differential is only about 10 basis points greater.

Average Real Wage Differential

The Trustees have set the ultimate value for the average real wage differential (the rate of change in the average OASDI covered wage less the rate of change in the CPI-W) at 1.12 percent. This value is derived from the Trustees' assumptions of 1.68 percent for total-economy productivity growth, the -0.40 percent for the GDP deflator price differential, an assumed -0.11 percent annual decrease for the average earnings ratio, no change in the compensation ratio, and a -0.05 percent annual decline in the average hours worked per week. (The average earnings ratio is the share of total compensation represented by wages and self-employment income; it is one minus the variable RY_t in equation (9) above. The compensation ratio equals total compensation divided by GDP; it is the variable $RWSSY_t$ in equation (8) above.)

Thus the validity of the assumed value for the real wage ratio depends on the validity of these underlying assumed values. If the productivity assumption is too high, the real wage growth will be also. If the GDP deflator grows at a rate closer to that forecast for the CPI-W, higher real wage growth will result. (The Trustees assume that aggregate nominal earnings increase with the GDP deflator, but measure real earnings growth based on the CPI-W.) If the average hours worked per week decline at a faster rate, then real wage growth declines. If either the average earnings or compensation ratios decline, real wage growth does as well.

The Trustees' ultimate assumed value for the real wage differential is in line with, or slightly lower than, the real growth for average real U.S. earnings projected by private forecasters and by the OMB and CBO. However, it is not clear that these forecasts, or the metric underlying the Trustees' real wage differential, are comparable to the real growth in the average wage index. The Trustees note that their 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 (1973 to 2007), but roughly equal to the 1.10 percent historical average annual real growth rate over the last five complete cycles (1966 to 2007). *Note that the trendline growth in the average wage index deflated by the CPI-W is only 0.56 percent over this same period.* Clearly there is a disconnect between the benchmarks relied on by the Trustees and the real growth in the variable of interest to forensic economists. This disconnect likely stems from the Trustees' focus on future growth in aggregate real earnings and forensic economists' interest in the growth in earnings per worker.

Unemployment Rate

The Trustees have assumed an ultimate (full-employment) value of 5.5 percent for the unemployment rate. As noted earlier, the assumed unemployment rate is age- and sex-adjusted based on the 2010 age-sex distribution of the civilian labor force. It differs from the published headline unemployment rate; the adjusted rate has been less than the published rate for each of the last 5 business cycles. Though not cited as the reason for the assumed value, the 5.5 percent equals the average over the last four business cycles. In explaining their assumption, the Trustees note that they assume that the female labor force participation rate will stabilize and that workers will stay in the labor force longer due to increased life expectancy: the net effect is expected to be a decrease in the growth of the supply of labor which will put some downward pressure on the aggregate unemployment rate.

The Trustees 5.5 percent is greater than the forecasts of Global Insights and Macroeconomic Advisers, and below Moody's Analytics. It is also greater than the OMB and CBO forecasts.

Trust Fund Real Interest Rate

The Trustees set the assumed ultimate long-range trust fund real interest rate to 2.9 percent. In discussing this assumption, the Trustees cite the historical experience for each of the last five economic cycles. This is shown in the following table:

Table A1: Average Real Trust Fund Interest Rate

1966-1973	1.84
1973-1979	-0.13
1979-1989	5.54
1989-2000	4.38
2000-2007	2.19

The Trustees acknowledge the then-current bond purchases by Fed, but made no assumption about how long they might continue. Similarly, the Trustees acknowledged that over the near term Treasury yields can be expected to remain at depressed levels as long as the economy remains weak and Europe's sovereign debt crisis remains unresolved. The Trustees also stated that in the post-1987 period, the real rate averaged 3.2 percent and that from the late 1980s to the early 1990s large federal budget deficits put upward pressure on real interest rates. Although the Trustees acknowledge that federal debt is expected to continue to grow over the short-range period, they state "it is reasonable to believe that the Federal government would have to restore fiscal sustainability over the remainder of the long-range period" and give this belief as a reason for their assumed ultimate value of 2.9 percent. They conclude that increasing deficits will result in higher real rates.

The Trustees' 2.9 percent is about 20 basis points below the long-range forecasts of Global Insights, Macroeconomic Advisers, and Moody's Analytics. The OMB and CBO project real interest rates of 2.9 and 3.0 percent starting in 2021 and 2068, respectively.

Figure 1

Overview of the Long-Range OASDI Projection Methodology
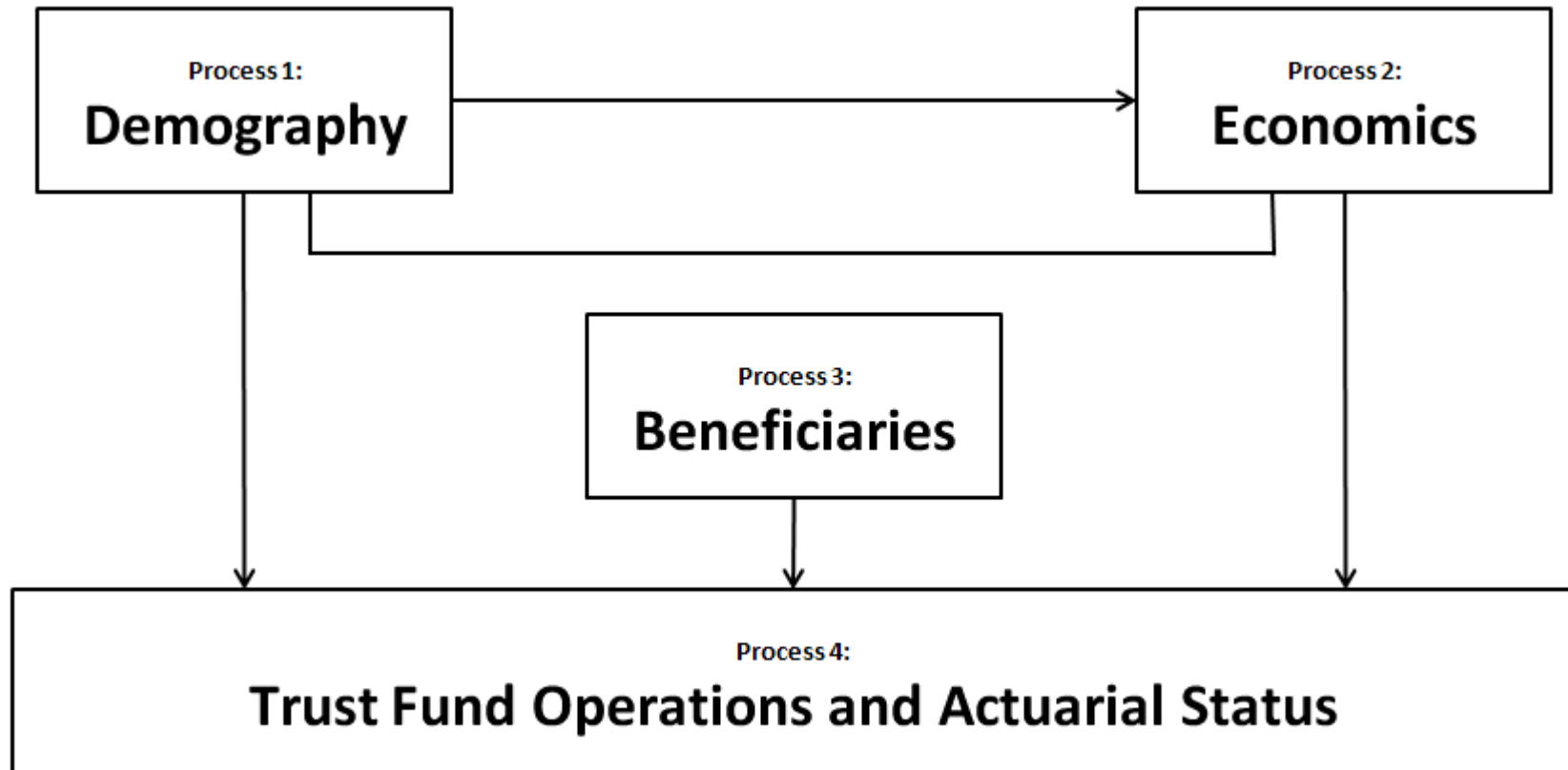
Figure 2
Inputs, Outputs and Processes of Interest to Forensic Economists

**Assumptions**

Fertility and Mortality Rates

Legal and Other Immigration

Process 1:
Demography

Output
Social Security Area Population Including Immigrants

Assumptions
Military Population
(unchanged for 10 years; then grows at same rate as civilian rmployment)

Ultimate Unemployment Rates
(Reached in last half of first 10 years; smooth transition to that point)

Annual Change in:
Real wage differential
Total economy productivity
Ratio of wages to compensation
Ratio of compensation to GDP
CPI for Urban Wage Earners & Clerical Workers (CPI-W)
CPI-W and GDP deflator price differential
Annual trust fund real interest rate

Add Factors to Move an Estimate Closer to an Expected Value

Process 2:
Economics

Outputs of Interest to FE's

Real and Nominal GDP
Real and Nominal Potential GDP
Average Covered Earnings per Worker
Average Wage Index
CPI-W and GDP Deflator

Figure 3

Frequency Distribution of the Difference in Annual Inflation Measured by the CPI-U versus the Adjusted CPI-W
(Basis Points)
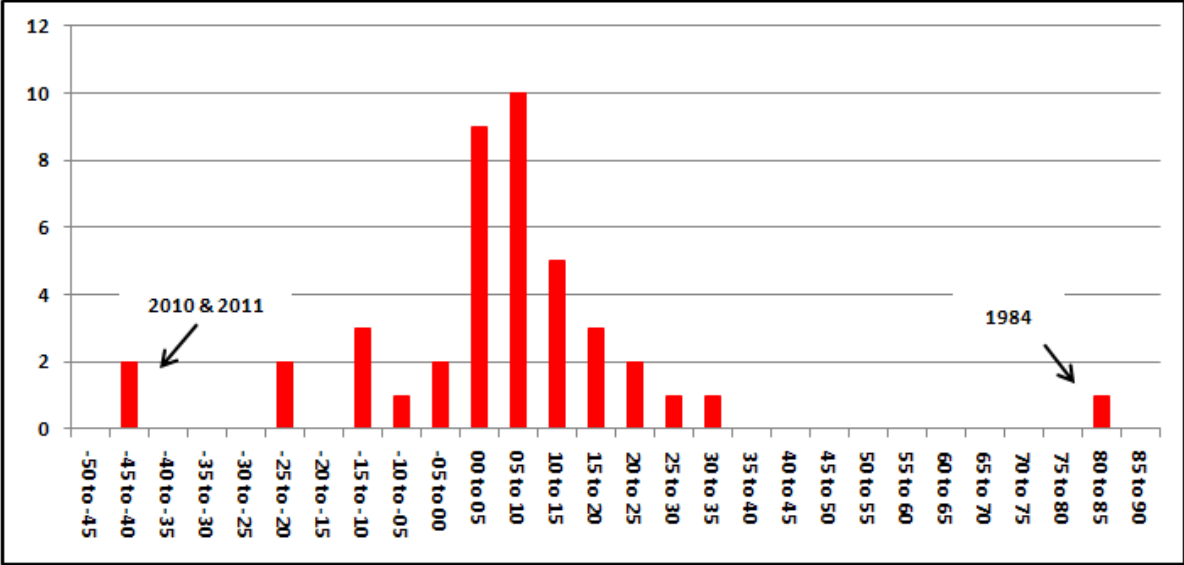
Mean Difference = 5.0 Basis Points

Figure 4

SSA Trustees' Historical and Forecasted Nominal and Real Long-Term Interest Rates
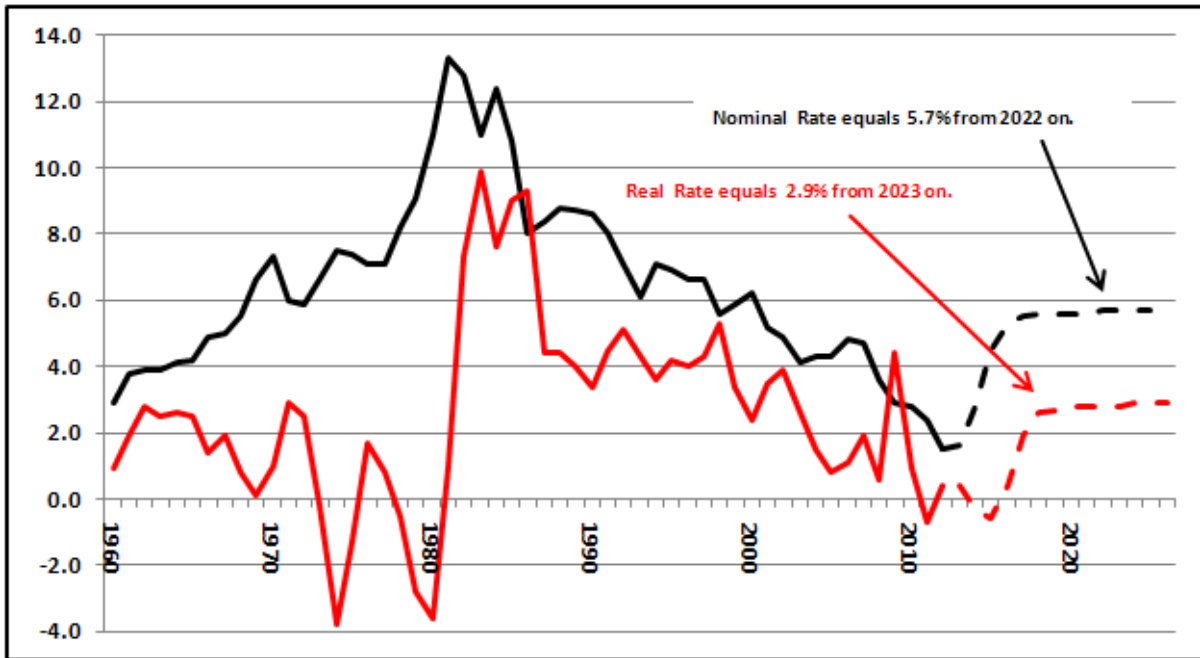
Figure 5

Nominal SSA Long-Term Rate vs.
7-, 10- and 20-Year Treasury Yields
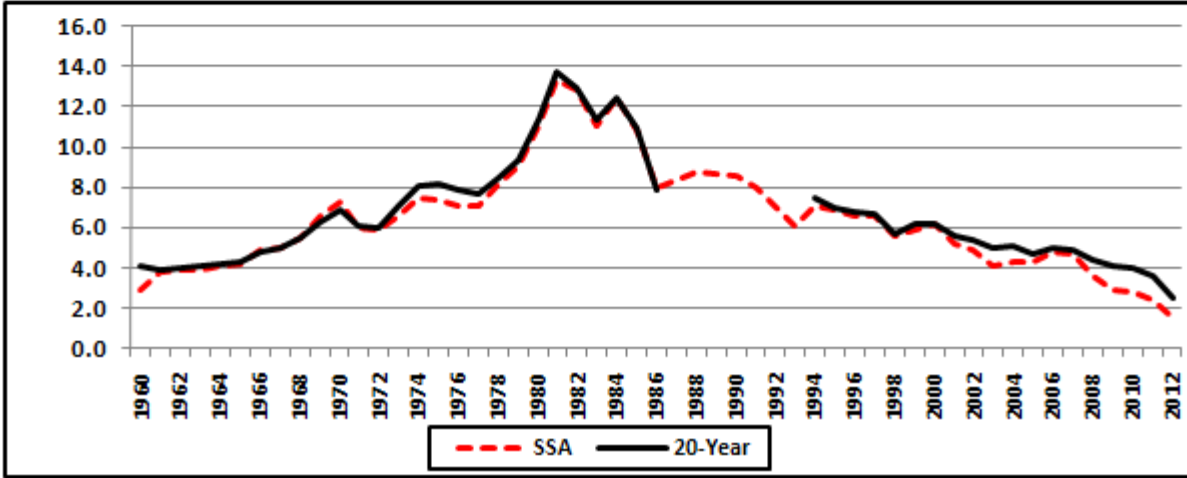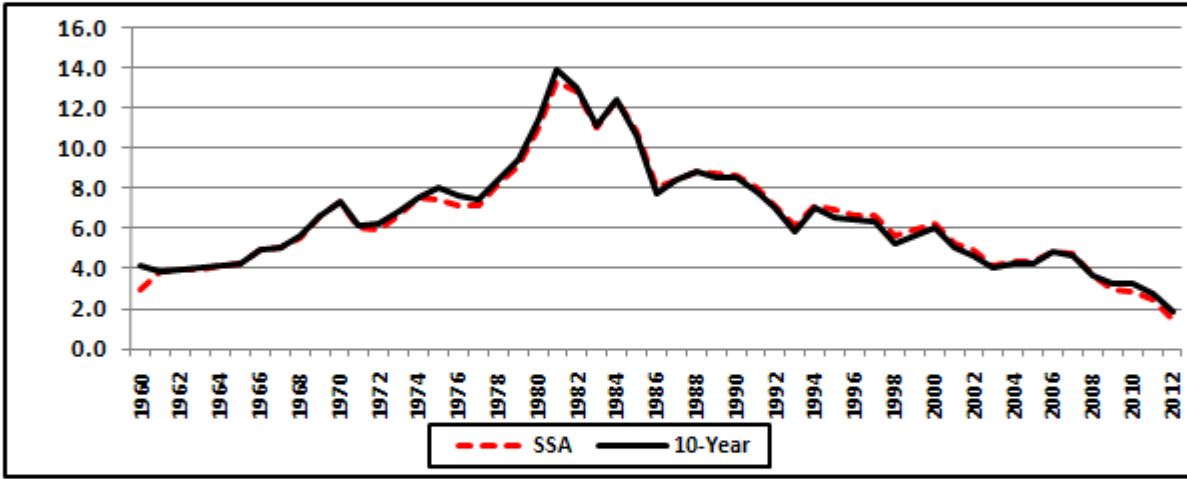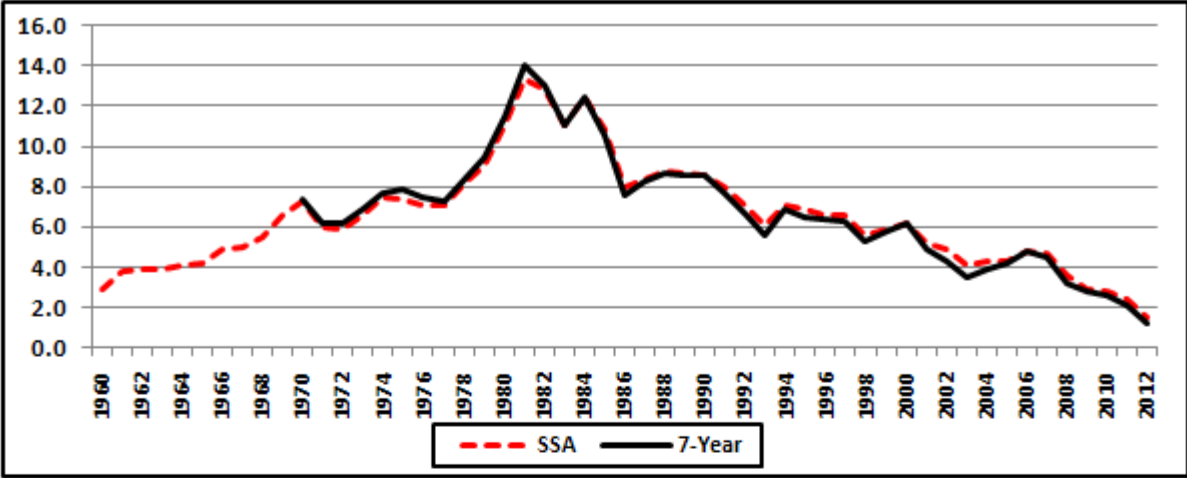
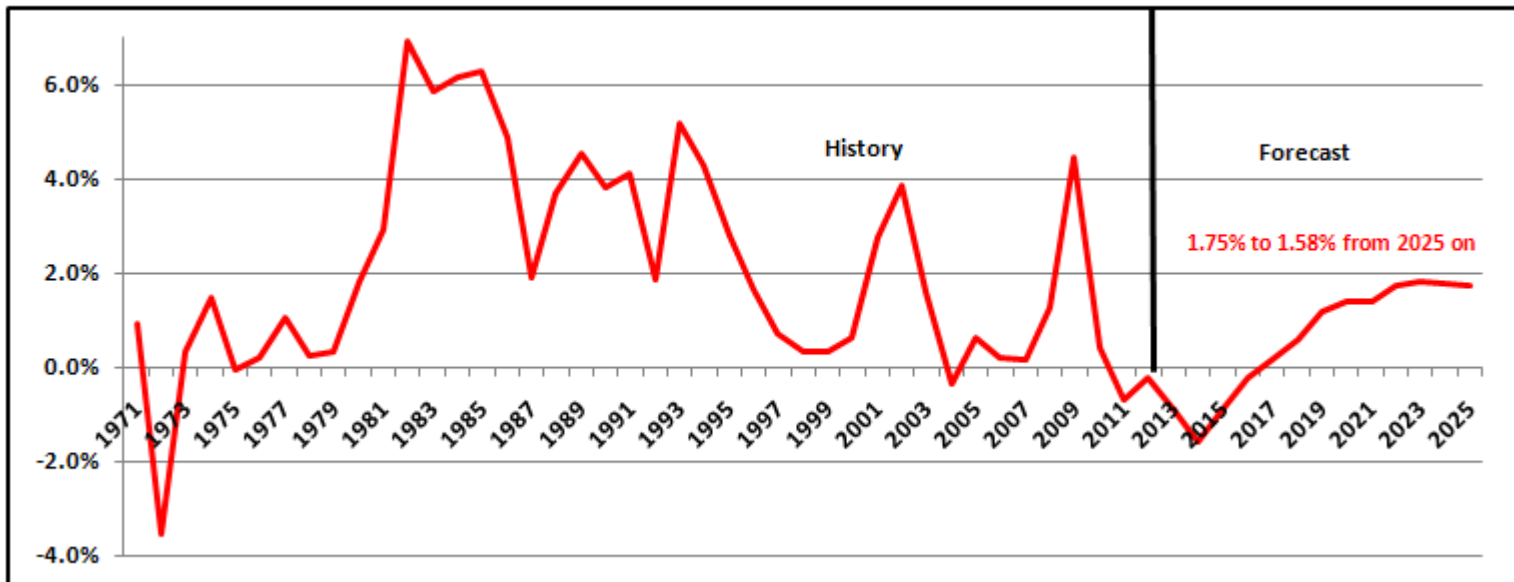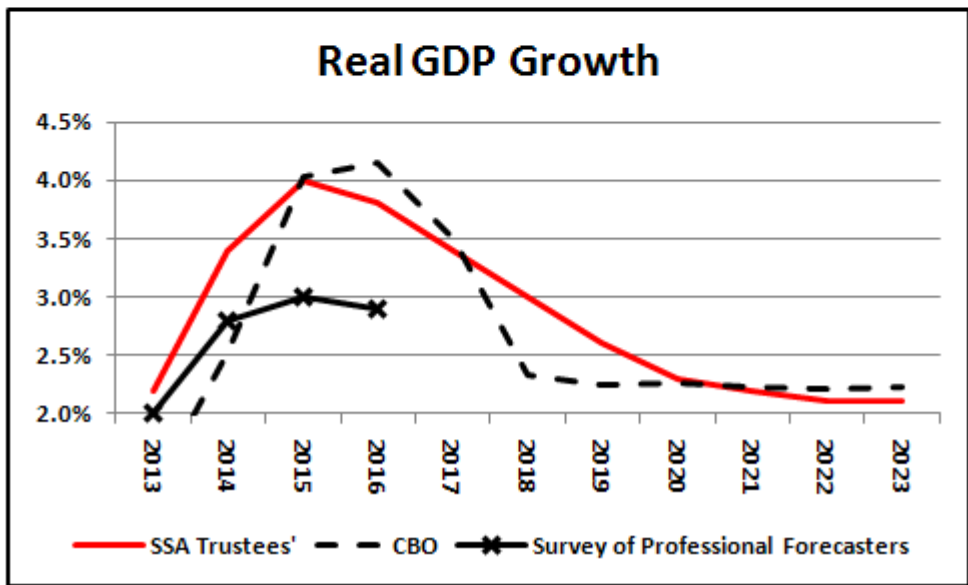**Figure 6**

Comparison of the Average Wage Index With the
Private Industry Wage & Salary ECI and
With Average Weekly Earnings
(1976 = 100)
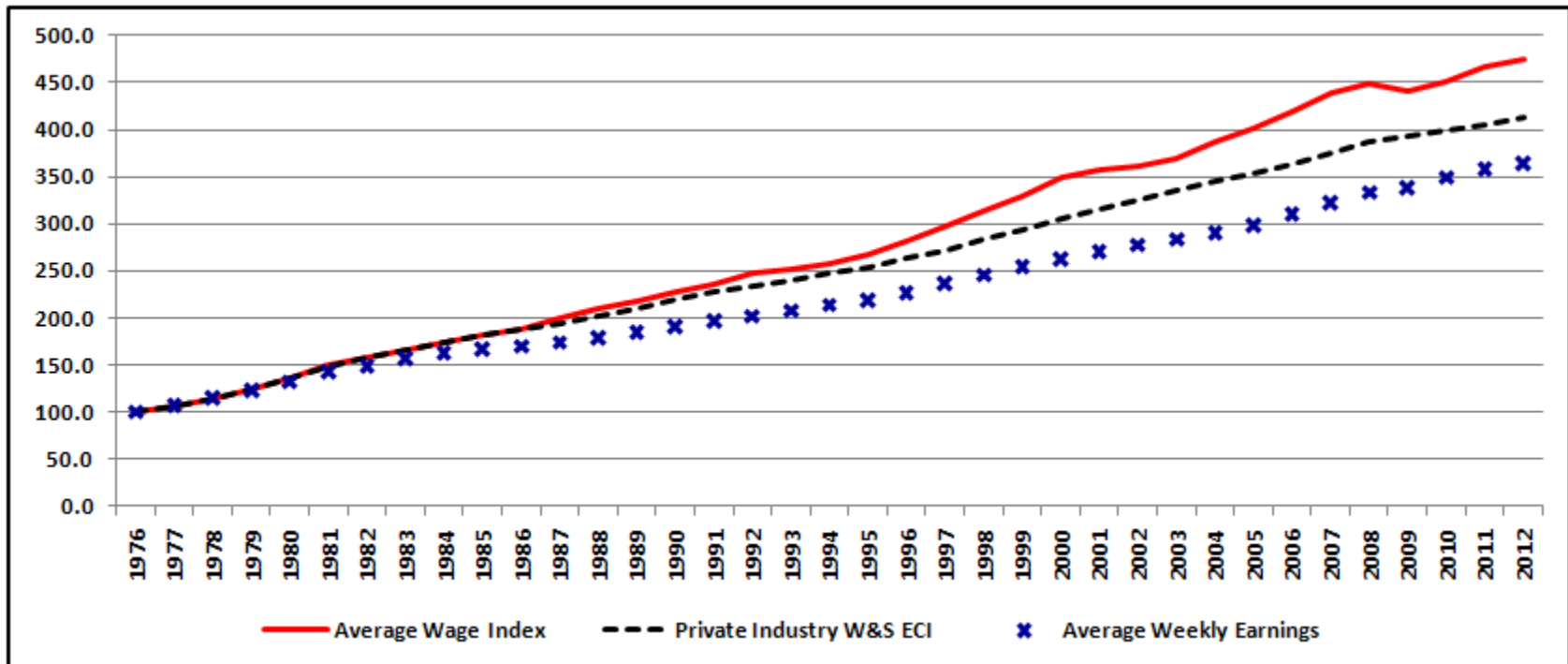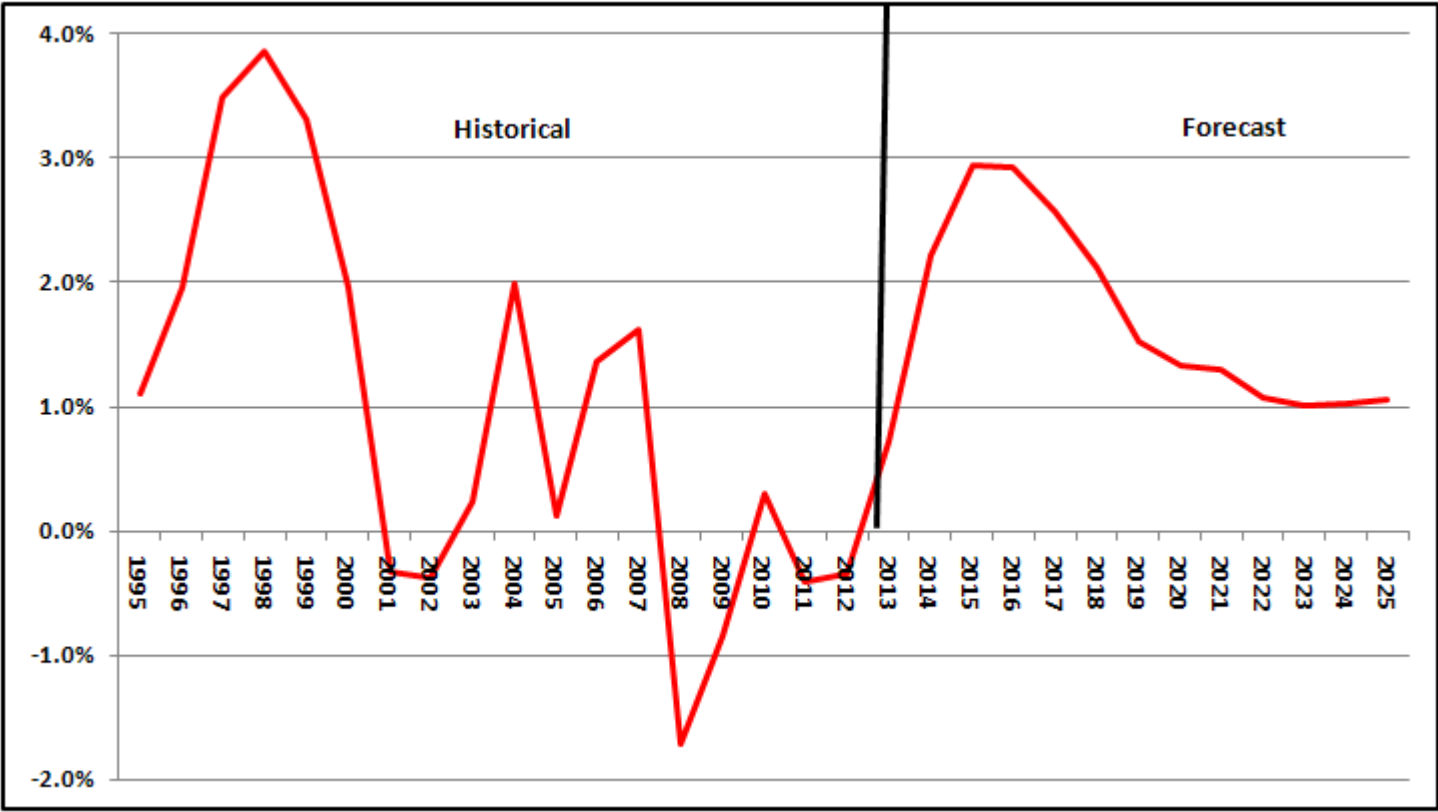
Figure 7

SSA Trustees' Implied Net Discount Rate

Figure 8

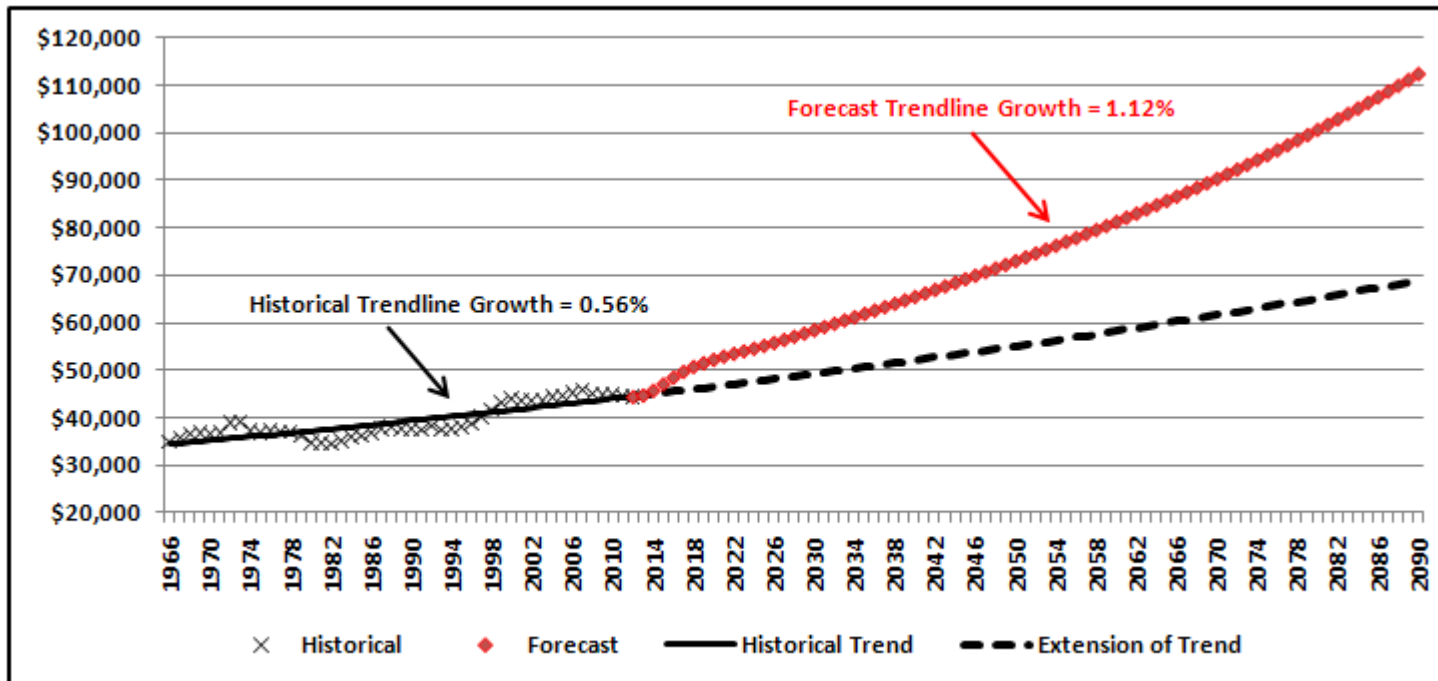# Comparison of the Forecasts of the Unemployment Rate and Real GDP Growth
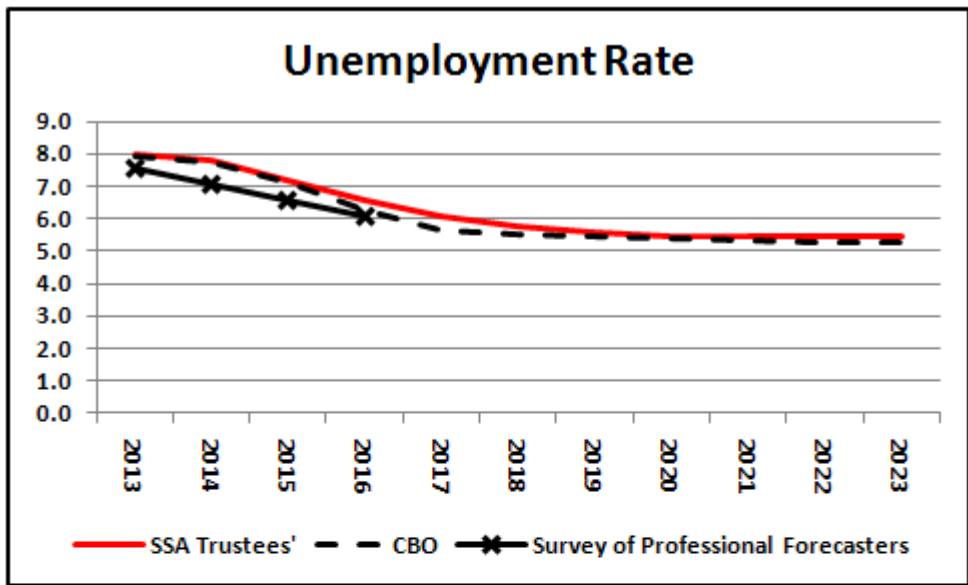
Figure 9

Impact of the Lower Unemployment and Higher Real Growth Forecasts
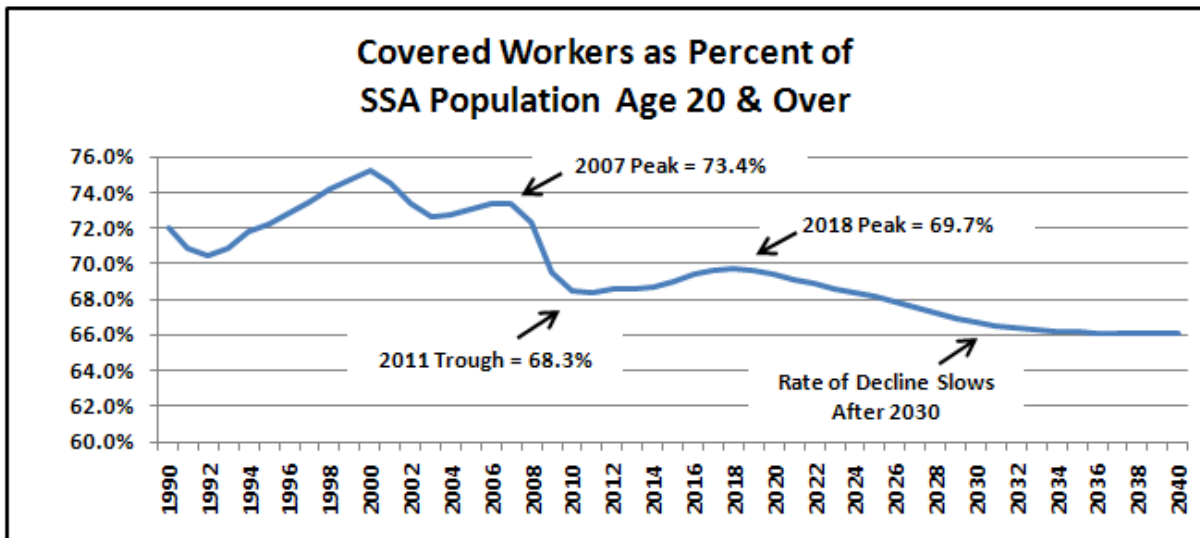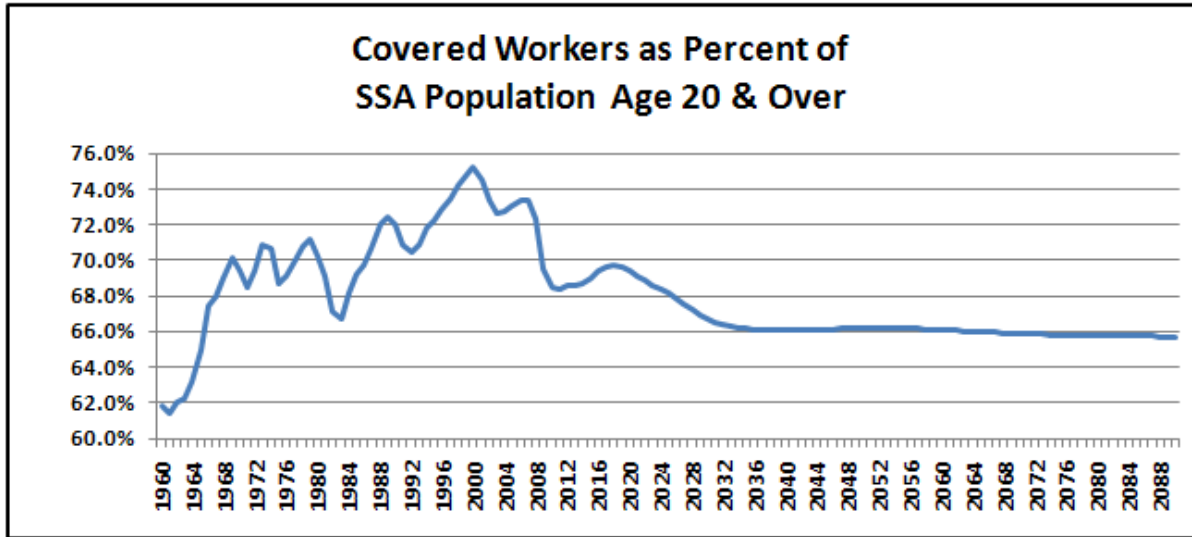
Figure 10

Historical and Projected Real Growth in the Average Wage Index

Figure 11

Historical and Projected
Real Average Wage Index
(Deflated by the CPI-W – 2013 $s)

Figure 12

Historical and Projected
Real Average Wage Index
(Deflated by the GDP Deflator – 2013 $s)