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SOCIAL SECURITY AND SAVING:
NEW TIME SERIES EVIDENCE

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ABSTRACT

This paper reexamines the results of my 1974 paper on Social Security and saving with the help of an additional twenty-one years of data. The estimates presented here reconfirm that each dollar of Social Security wealth (SSW) reduces private saving by between two and three cents. The parameter estimates for the postwar period and for the entire sample since 1930 are very similar. The correction of the error in the original SSW series between 1958 and 1971 therefore does not significantly affect the original results. The estimated effect of SSW is robust with respect to the addition of a variety of variables that have been suggested in previous critiques of the original study. In the aggregate, the parameter values imply that the Social Security program currently reduces overall private saving by nearly 60 percent.

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Social Security and Saving: New Time Series Evidence

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More than twenty years ago I published an analysis of the effect of Social Security retirement benefits on personal saving (Feldstein, 1974). That paper extended the traditional life cycle model by recognizing that the age at which retirement occurs is endogenous and is likely to be influenced by the provision of Social Security benefits, especially when benefits are paid only to those who are no longer in full time employment. The extended life-cycle model with endogenous retirement implies that the provision of Social Security retirement benefits has two countervailing effects: a traditional wealth replacement effect that reduces personal saving as individuals substitute expected government benefits for personal saving and an induced retirement effect that increases personal saving by increasing the expected duration of retirement. The relative importance of these two effects depends on the parameters of the individual's utility function.

Despite this a priori ambiguity, the evidence in my 1974 paper clearly indicated that higher Social Security benefits reduce private saving. More specifically, the parameter estimates of an aggregate consumption function extended to include Social Security wealth (SSW), defined as the present actuarial value of the benefits to which current employees are entitled, implied that each additional dollar of Social Security wealth reduced private saving by 2.1 cents (with a standard error of 0.6 cents). Since SSW was almost exactly twice gross national product in

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1971, this implied a reduction of saving equal to four per cent of G.N. P., equivalent to about a 40 percent reduction in personal saving.

Nearly a decade after the publication of these results, Dean Leimer and Selig Lesnoy (1982) found that an error had been made by the programmer who converted my specification of the Social Security wealth variable into a statistical series. The error, which related to the change in benefits for surviving spouses that was enacted in 1957, caused my original SSW series to grow faster after 1957 than it should have. When Leimer and Lesnoy corrected the computer program and extended the sample to 1974, they found that the coefficient of the SSW variable dropped from my original estimate of 0.021 to only 0.011 and that the standard error rose from 0.006 to 0.010. The effect of SSW on personal saving appeared only half as large and was not significantly different from zero.

In my reply to Leimer and Lesnoy (Feldstein, 1982) I noted that the principal reason for their very small and statistically insignificant estimate was not the correction of the programming error but the extension of the sample to 1974 without taking into account the major change in Social Security benefit rules that began in 1972. Before 1972, benefits were not indexed for inflation but were adjusted occasionally by Congress in a way that caused the ratio of average benefits per retiree to per capita personal income to vary around 0.42 without any discernible trend. In 1972, Congress raised benefits by 20 percent and indexed them so that future inflation would not reduce the relative level of benefits in the future.¹

¹The mean value of the benefit of male retirees to per capita disposable income was 0.419 (with a standard deviation of 0.096) from 1940 through 1971 and then rose to 0.517 (with a standard deviation of 0.029) from 1972 to 1992.

The natural adjustment to the Social Security wealth variable was therefore a 20 percent increase beginning in 1972. When I made this adjustment, the estimated coefficient of the adjusted Social Security wealth variable (SSW) was 0.017 (with a standard error of 0.008) for the Leimer-Lesnoy sample period (1930 through 1974) and was 0.018 (with a standard error of 0.009) when the sample was extended for two additional years that had not been available to Leimer and Lesnoy but that were available at the time of my reply. Thus, when the SSW variable was adjusted for the major benefit change after 1971, the estimated effect of social Security on private saving was nearly as large as it had been in the pre-1972 sample (0.021) and statistically very significant.

It was of course difficult to be confident about the appropriateness of modeling the change in individual expectations by this 20 percent adjustment factor. Although the sum of squared residuals was smaller with the adjusted Social Security wealth series than with the unadjusted Social Security wealth series, the number of observations after 1971 was very small.

One approach to this difficulty was to avoid the problem completely by restricting the sample period to the years 1929 through 1971 before the legislative change occurred. When I did that, the estimated coefficient of the SSW variable was 0.015 with a standard error of 0.0095. The corrected point estimate was thus 30 percent smaller than my original estimate and the standard error implied that the probability of observing such a large coefficient if the true value were not positive was less than 0.08. Although this was not as strong an effect as in the larger sample, it was larger and statistically more significant than the result reported by Leimer and Lesnoy.

It is now possible to look at evidence for a substantially longer period ending in 1992.² The 21 years of observations with Social Security benefits indexed for inflation after the initial 20 percent increase makes it possible to test explicitly whether consumers did respond to the increased level of benefits. The longer time series also permits estimating the effect of Social Security benefits in the postwar period alone, avoiding the potential problems of including the pre-war depression years in the estimation period. I will also use these new data to examine an alternative specification proposed in Robert Barro's 1978 study which implied that Social Security wealth did not depress personal saving.

1. Extended Sample Estimates

The basic specification in my original 1974 article was a simple expansion of the Ando-Modigliani (1963) aggregate life cycle consumption function relating the annual value of real per capita consumption (C) to real per capita disposable income (YD), its lagged value (YD_{t-1}), real per capita household wealth (W) and real per capita Social Security wealth (SSW). The updated estimate of this equation, using data from 1930 through 1992 (with the exclusion of the World War II years 1941 through 1946), is:

²The data on Social Security wealth and on household net worth used in this paper are presented in the appendix. See Feldstein (1974) for an explicit statement of the definition of Social Security wealth. Benefits are calculated on the assumption that wage related variables grow at a real rate of two percent and that all benefits are discounted at three percent. The stocks of household wealth and of consumer durables are from the Flow of Funds Balance Sheets of the U.S. Economy for 1945 to 1992. Earlier values are based on data in Feldstein (1974). The other data used in the current paper are from the national income accounts.

$$(1) \quad C = 752 + 0.53 \text{ YD} + 0.038 \text{ YD}_{t-1} + 0.033 \text{ W} + 0.041 \text{ SSW}$$

$$\quad \quad \quad (0.07) \quad (0.079) \quad (0.007) \quad (0.012)$$

1930-92
SSR = 722495
DWS = 0.68

The coefficient of SSW is larger than in the earlier estimates and more than three times its standard error. Extending the sample thus reinforces the conclusion of the original study. Since the R-squared values for all of the equations presented in this paper exceed 0.99, I do not present them. I do show the sum of squared residuals so that this can be compared across specifications and the Durbin-Watson statistic (DWS). The very low value of the DWS indicates that there is very substantial autocorrelation of the residuals and therefore that the standard errors are biased down.

The Hildreth-Lu procedure of simultaneously estimating the autocorrelation of the disturbances and the coefficients provides more efficient parameter estimates and consistent estimates of the standard errors. Equation (2) presents the Hildreth-Lu estimate of the same specification as equation 1:

$$(2) \quad C = 641 + 0.63 \text{ YD} + 0.074 \text{ YD}_{t-1} + 0.014 \text{ W} + 0.028 \text{ SSW}$$

$$\quad \quad \quad (0.06) \quad (0.053) \quad (0.008) \quad (0.013)$$

1930-92
SSR = 339935
DWS = 1.89
rho = 0.80

The coefficient of SSW is 0.028 with a standard error of 0.013, a statistically significant and economically important magnitude.³ The Hildreth-Lu correction also raises the value of the coefficients of disposable income and reduces the coefficient of household wealth.

Table 1 summarizes the key information from equations (1) and (2) as equations 1.1 and 1.2 and presents similar information about alternative specifications and time periods. Equation 1.3 uses the unadjusted Social Security wealth variable (SSWU) that has not been adjusted for the 20 percent 1972 benefit increase. Thus $SSWU = SSW$ before 1972 and $SSWU = (1.2)^{-1} SSW$ after 1972. The substantial increase in the sum of squared residuals (363582 versus 339935 in equation 1.2) shows that the adjusted SSW variable provides a substantially better explanation of consumption behavior. As a formal test of the appropriateness of the post-1972 adjustment, equation 1.4 adds the variable $SSWD = SSW - SSWU$, i.e., the post-1972 adjustment. The estimate shows that this variable is not statistically significant (the t-statistic is 0.54), implying that SSW is preferable to $SSW - SSWD = SSWU$ or to any linear combination of the two.

Although the Hildreth-Lu estimate provides a better basis for the parameter estimation and test, I also report an ordinary least squares estimate of the equation with the unadjusted SSWU variable (equation 1.5) that can be compared with equation 1.1. I do so to reassure readers that the Hildreth-Lu procedure does not produce a different implication than the OLS estimation. The SSR value with the SSWU variable is substantially larger than the corresponding SSR with the adjusted SSW variable: 853614 versus 722495, implying again that the adjusted SSW variable is the appropriate one.

³ The aggregate implication of a SSW coefficient of 0.028 is discussed later in the text.

My original 1974 equations also included a measure of corporate retained earnings, based on the view that shareholders look through the corporate veil to corporate earnings that are not distributed as dividends and give greater weight to these retained earnings than would be implied by the indirect effect through the value of household wealth. Rather than confuse the current discussion of SSW with the debate about the implication of retained earnings, I will only show that including the retained earnings variable (RE, the real per capita earnings per person) does not alter the estimated effect of SSW. Using the Hildreth-Lu estimation, the retained earnings variable has a coefficient of 0.36 with a standard error of 0.13. The SSW variable remains essentially unchanged at 0.027 with a standard error of 0.012. This is reported in equation 1.6.

Equation 1.7 reports the results of substituting Social Security wealth net of the present value of future Social Security payroll taxes (SSWN) for the gross Social Security variable. For this purpose, future payroll taxes are estimated by gender (to reflect mortality differences). Employees under age 65 are assumed to retire at 65 while those over 65 are assumed to retire after one more year. The coefficient of SSWN is 0.030 with a standard error of 0.015, slightly higher than the coefficient of gross Social Security wealth in equation 1.2. The choice between gross and net social security wealth thus does not affect the basic conclusion that Social Security wealth has a large and statistically significant effect on private saving. The SSR measure with SSWN is slightly higher than with the regular SSW variable, implying that the regular SSW variable is the preferred specification.

2. The Postwar Sample

My 1974 paper presented estimates for the postwar period in order to avoid relying on the unusual years of the depression and on the contrast between the zero Social Security wealth years before the introduction of the Social Security program and the years after its introduction. Unfortunately, there were too few observations and too little variation in the explanatory variables in the postwar period from 1947 through 1971 for which data were then available to permit relatively precise estimates for those postwar years. The new data nearly doubles the number of postwar observations and makes it possible to obtain estimates with quite small standard errors. Table 2 repeats the basic estimates of Table 1 for the postwar years.

The adjusted SSW variable has postwar coefficients that are quite similar to the coefficients for the entire period: 0.043 with OLS estimation in equation 2.1 (versus 0.041 for the period since 1930 in equation 1.1) and 0.031 with Hildreth-Lu estimates (vs. 0.028 for the period since 1930). In contrast, the coefficients of the SSWU variables are less stable and are actually substantially greater than the coefficients in the full sample period. A comparison of the SSR values also shows that the adjusted SSW variable is statistically preferable to the unadjusted SSWU variable. Once again, adding a retained earnings variable does not have a significant effect on the estimated effect of SSW on private saving. Finally, the coefficient of the net Social Security wealth variable (SSWN) is very similar to the coefficient of that variable in the full sample.

3. Aggregate Savings Implications of the Social Security Program

Before looking at other variables in a more general specification, it is useful to consider the implications of these estimates for the effect of Social Security wealth on aggregate national saving. For this calculation, I will use the Hildreth-Lu full sample estimate of 0.028 dollars of additional consumption per additional dollar of SSW, a slightly smaller parameter value than either the OLS estimate or the Hildreth-Lu estimate for the postwar period and substantially smaller than the OLS estimate for the full sample.

Since the Social Security wealth in 1992 was \$14,246 billion dollars (in 1992 prices), the implied effect of SSW is to raise personal consumption expenditures by \$400 billion and therefore to reduce personal saving by an equal amount. The Social Security program also reduces personal saving through the effect of the Social Security payroll tax on disposable income. In 1992, the Social Security payroll tax (the OASI tax, excluding the Medicare and Disability portions) collected revenue of \$279 billion. The long-run propensity to consume of 0.70 (from equation 2) implies that the \$279 billion payroll tax reduced consumption by \$195 billion and saving by \$84 billion. The implied effect on saving of the future Social Security benefits (\$400 billion) is therefore about five times the effect of the current tax levy.

Combining the two effects implies that the Social Security program reduced personal saving in 1992 by \$484 billion. Since total personal saving in 1992 was \$248 billion (in 1992 dollars), the implied effect of the Social Security program was to reduce personal saving by 66 percent of the potential personal saving, i.e., the sum of the actual level of personal saving in 1992 and the reduction induced by Social Security. More generally, since total private saving in 1992 (including corporate saving as well as personal saving) was \$333 billion, the implied effect

of Social Security was to reduce private saving by 59 percent of its potential.

For comparison, my 1974 paper estimated that SSW depressed saving in the final year of that sample (1971) by \$61 billion (in 1971 prices), an amount equivalent to 50 percent of potential personal saving in 1971.⁴

4. Effects of Additional Variables on the Implied Impact of Social Security Wealth

In their original paper on life cycle saving, Ando and Modigliani (1963) suggested including the unemployment rate as well as the current and lagged values of income to represent the permanent or projected future level of income. They reasoned that current disposable income understates long-run income when the unemployment rate is high. When I included the unemployment rate (RU) in Feldstein (1974) the coefficient was not statistically significant (1.17 with a standard error of 0.89). Although including the unemployment rate also had the effect of halving the coefficient of SSW (to 0.011 with a standard error of 0.010), because of the statistical insignificance of the RU variable itself I did not pursue the unemployment variable further.

Subsequent commentators (e.g., Esposito, 1979) stressed the potential relevance of the unemployment variable and argued that the estimated coefficient of SSW when RU is included raised serious doubts about the basic estimates of the impact of SSW. Barro (1978) suggested that the unemployment variable should be entered as the product of the unemployment rate and

⁴ That 1971 estimate was of course based on the national income account data available at that time and is therefore not strictly comparable to the current national income account estimates for 1971. Redoing the calculation using the current national income account data and the parameter estimates from equation 2 implies that the Social Security program reduced personal saving in 1971 by 47 percent of its potential value. The higher ratio in 1992 than in 1971 reflects the lower observed ratio of saving to GDP in 1992 than in 1971.

the level of real per capita disposable income (RU*YD) and found that adding this variable, as well as the real per capita government budget surplus (GSURP) and the real per capita stock of consumer durables (CDUR), to the initial specification caused the coefficient of the SSW variable to be no longer significant.⁵

This section adds these variables to the basic specification of section 1 for the larger sample period that is now available and shows that they do not change the coefficient of SSW for either the full sample or the postwar period. The key parameters of interest are shown in Table 3. Each of the equations also contains the basic variables of equation 1: SSW, YD, YD_{t-1} , W, and a constant term.

Equations 3.1 through 3.4 add the unemployment rate to the basic specification. The estimated coefficient of the RU variable is very unstable. It has the wrong sizes in three of the four equations and is also less than the standard error in three or the four equations. Moreover, including this variable has little effect on the estimated effect of SSW. For example, in the full sample Hildreth-Lu estimates the unemployment rate coefficient is 2.93 with a standard error of 5.91 and the SSW coefficient remains essentially unchanged at 0.027 with a standard error of 0.13.

Equations 3.5 through 3.8 repeat these estimates, substituting the product of the unemployment rate and the real per capita level of income for the unemployment rate. The coefficient of this modified unemployment rate variable is always negative and is statistically

⁵ The Barro estimates were for the years 1930 through 1974 and used my initial SSW variable (before the correction of the program error for 1958 through 1971) with three additional years of data.

significant only in the OLS estimates. The coefficients of SSW in these equations are again essentially the same as they are in Table 1.

Equations 3.9 and 3.10 repeat the full Barro specification for the post-war period. With the Hildreth-Lu procedure (equation 3.10), the unemployment and government surplus variables are statistically significant and the coefficient of the SSW variable is essentially unchanged at 0.029 with a standard error of 0.017. The coefficient of the consumer durable variable is not significant. In the OLS estimates (equation 3.9) all four variables are significant and the coefficient of the SSW variable is slightly larger than it is in the simpler specification of equation 1.1 (0.054 with a standard error of 0.014).

Although there is now relatively high quality data on the stock of consumer durables in the postwar period, these data cannot be extended to the prewar years. For the full sample, I have therefore included the unemployment and government surplus variables and omitted the consumer durables variable. The result, presented in equations 3.11 and 3.12, shows once again that a more general specification does not change the magnitude or the statistical significance of the coefficient of SSW.

IV. Conclusion

This paper has reexamined the results in my 1974 paper with the help of an additional twenty one years of data. Although it would be desirable to extend the initial specification in a variety of ways, that lies beyond the intended scope of this analysis. The estimates presented here reconfirm that each dollar of Social Security wealth (SSW) reduces private saving by between two and three cents. The parameter estimates for the postwar period and for the entire

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sample since 1930 are very similar. The correction of the programming error in the original SSW series between 1958 and 1971 therefore does not significantly affect the original results. The estimated effect of SSW is robust with respect to the addition of a variety of variables that have been suggested in previous critiques of the original study. In the aggregate, the parameter values imply that the Social Security program currently reduces overall private saving by nearly 60 percent.

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Table 1
The Effects of Social Security Wealth on Consumer Spending, 1930-92

Equation	Method	SSW Definition	Other Variables*	SSW	SSR	DWS
1.1	OLS	SSW	YD YD _{t-1} W	0.041 (0.012)	722495	0.68
1.2	H-L	SSW	YD YD _{t-1} W	0.028 (0.013)	339935	1.89
1.3	H-L	SSWU	YD YD _{t-1} W	0.020 (0.021)	363582	1.97
1.4	H-L	SSW	YD YD _{t-1} W SSW-SSWU	0.019 (0.021)	337095	1.83
1.5	OLS	SSWU	YD YD _{t-1} W	0.025 (0.016)	853614	0.58
1.6	H-L	SSW	YD YD _{t-1} W RE	0.027 (0.012)	292907	1.89
1.7	H-L	SSWN	YD YD _{t-1} W	0.030 (0.015)	242283	1.83

Method: OLS is ordinary least squares. H-L is Hildreth-Lu

SSW Definition: SSWU = SSW not adjusted for 20 percent increase in 1972; SSWN = Social Security wealth net of future taxes

*Other variables: YD = disposable personal income, W = household wealth; RE = corporate retained earnings. All equations contain a constant term.

All variables are real per capita in 1987 dollars.

Table 2

The Effects of Social Security Wealth on Consumer Spending, 1947-92

Equation	Method	SSW Definition	Other Variables*	SSW	SSR	DWS
2.1	OLS	SSW	YD YD _{t-1} W	0.043	703427 (0.016)	0.56
2.2	H-L	SSW	YD YD _{t-1} W	0.031 (0.017)	290826	1.78
2.3	H-L	SSWU	YD YD _{t-1} W	0.058 (0.037)	297646	1.95
2.4	H-L	SSW	YD YD _{t-1} W SSW-SSWU	0.058 (0.037)	286193	1.83
2.5	OLS	SSWU	YD YD _{t-1} W	0.083 (0.035)	724620	0.53
2.6	H-L	SSW	YD YD _{t-1} W RE	0.022 (0.014)	193180	1.80
2.7	H-L	SSWN	YD YD _{t-1} W	0.028 (0.018)	297094	1.78

Method: OLS is ordinary least squares. H-L is Hildreth-Lu

SSW Definition: SSWU = SSW not adjusted for 20 percent increase in 1972; SSWN = Social Security wealth net of future taxes

*Other variables: YD = disposable personal income, W = household wealth; RE = corporate retained earnings. All equations contain a constant term.

All variables are real per capita in 1987 dollars.

Table 3

The Effects of Additional Variables on the Coefficient of SSW

Equation	Period	Method	SSW	RU	RU*YD	GSURP	CDUR	SSR	DWS
3.1	30-92	OLS	0.045 (0.013)	-3.53 (4.45)				713692	0.73
3.2	30-92	H-L	0.027 (0.013)	2.93 (5.91)				341855	1.90
3.3	47-92	OLS	0.049 (0.015)	-42.7 (13.8)				566963	0.78
3.4	47-92	H-L	0.029 (0.017)	-9.51 (13.29)				287225	1.78
3.5	30-92	OLS	0.048 (0.121)		-0.144 (0.080)			679789	.078
3.6	30-92	H-L	0.028 (0.013)		-0.039 (0.105)			337115	1.89
3.7	47-92	OLS	0.050 (0.015)		-0.423 (0.133)			560759	0.74
3.8	47-92	H-L	0.029 (0.017)		-0.146 (0.135)			282691	1.79
3.9	47-92	OLS	0.054 (0.014)		-0.702 (0.152)	-0.277 (0.119)	-0.0150 (0.064)	428661	0.97
3.10	47-92	H-L	0.029 (0.017)		0.261 (0.155)	-0.176 (0.088)	0.105 (0.131)	251223	1.68
3.11	30-92	OLS	0.047 (0.012)		-0.273 (0.110)	-0.207 (0.122)		642919	0.78
3.12	30-92	H-L	0.030 (0.013)		-0.135 (0.117)	0.137 (0.080)		315547	1.74

Method: OLS is Ordinary Least Squares; H-L is Hildreth-Lu. Standard errors are shown in parentheses. All specifications also include YD, YD_{t-1}, W, and a constant term; see text equations (1) and (2). RU = unemployment rate. GSURP = surplus in government budget. CDUR = of consumer durables. All variables are real per capita in 1987 dollars.

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Appendix

Social Security Wealth and Household Net Worth

The following table shows the annual time series data for Gross Social Security Wealth (SSW), Social Security Wealth Net of Expected Future Taxes (SSWN), and Household Net Worth (W). All figures are are billions of 1987 dollars.

Year	SSW	SSWN	W
1930	0	0	3632.6
1931	0	0	3491.7
1932	0	0	3287.9
1933	0	0	3262.1
1934	0	0	3191.1
1935	0	0	3478.3
1936	0	0	3580.1
1937	448.1	225.3	3460.8
1938	426.1	213.4	3336.4
1939	472.1	225.6	3435.6
1940	806.5	517.5	3644.2
1941	1044.7	652.9	3638.0
1942	1315.1	821.4	3783.0
1943	1457.4	927.2	3877.3
1944	1453.2	934.8	3998.8
1945	1439.9	909.0	4166.1
1946	1468.6	875.0	4087.0
1947	1400.7	816.1	4060.5
1948	1363.3	780.9	4045.8
1949	1325.4	756.6	4237.7
1950	1419.9	796.7	4629.5
1951	1775.5	1027.4	4784.1
1952	1882.2	1085.2	4966.0
1953	1977.1	1135.3	5007.0
1954	1999.9	1152.2	5440.2
1955	2242.9	1300.7	5829.1
1956	2368.1	1374.0	6078.2
1957	2567.2	1472.8	5961.9
1958	2592.8	1491.1	6506.8
1959	2693.7	1528.3	6668.5
1960	2767.7	1561.1	6701.5
1961	2861.1	1623.1	7249.5
1962	3066.7	1761.0	7106.7

Year	SSW	SSWN	W
1963	3226.5	1845.4	7523.1
1964	3419.1	1949.7	7864.9
1965	3679.4	2081.2	8277.4
1967	4191.3	2341.6	8976.1
1968	4395.0	2443.3	9670.9
1969	4604.7	2531.6	9444.6
1970	4761.9	2626.6	9457.0
1971	4916.1	2709.1	9904.3
1972	6197.0	3860.1	10667.0
1973	6514.9	4034.4	10555.1
1974	6719.0	4159.2	10003.8
1975	6796.2	4238.4	10545.4
1976	7031.0	4369.6	11199.6
1977	7354.7	4552.7	11474.0
1978	7786.8	4789.4	12122.2
1979	8051.0	4951.6	12882.2
1980	8185.4	5058.8	13507.4
1981	8292.0	5145.1	13287.0
1982	8388.8	5256.5	13506.6
1983	8591.2	5401.7	13992.9
1984	9061.0	5669.6	14288.2
1985	9545.7	5973.8	15115.3
1986	10020.5	6275.6	15866.3
1987	10414.9	6529.0	16099.7
1988	10925.5	6854.4	16505.9
1989	11237.1	7057.6	17307.6
1990	11432.1	7235.2	16396.3
1991	11594.6	7348.5	17205.3
1992	11782.9	7480.5	17283.6