Data Appendix for "Pareto Improving Social Security Reform when Financial Markets are Incomplete!?"

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April 14, 2005

Abstract

In this appendix we describe the data we use in the paper, their detrending and time aggregation and we provide the raw data as well as selected summary statistics.

This appendix describes the data used in this paper. The financial data (stock returns, interest rate data) and the price index numbers from the CPI stem from Campbell (2003), and are available publicly at http://kuznets.fas.harvard.edu/~campbell/data.html. The wage and employment data come from the Bureau of Economic Analysis and are available at http://www.bea.doc.gov/bea/dn/nipaweb/Index.asp.

1 Raw Data

- Real Return Data are derived from the CRSP data set. Nominal returns are computed from prices and dividends of a NYSE/AMEX value weighted portfolio. Nominal returns are adjusted for inflation by the CPI reported in the Campbell data set. The original data file is called USAQE.asc
- Interest rates are derived from 30 day T-bill nominal rates in the CRSP. The interest rate data are in quarterly frequency, and adjusted for inflation by the inflation rate, computed with the CPI. The original data file is called USAQM.asc.
- Our measure of wages is real per worker total compensation. This measure is constructed as follows. Total compensation of employees as reported by the BEA in table 2.1, line 2.. We compute compensation per employee by dividing total compensation by the number of full time equivalent employees, again reported by the BEA in table 6.5, line 2.. We deflate the resulting compensation per employee measure by the annual CPI (for all urban consumers) reported by Bureau of Labor Statistics. We also used

the CPI as reported in the Campbell data set, with results that were virtually indistinguishable from the ones derived with the CPI reported by the BLS.

2 Time Aggregation of Returns and De-trending of Wages

For bond and stock returns we proceed as follows. The Campbell data set delivers quarterly net real returns on stocks r_t and bonds, rb_t. Following Campbell, Lo and MacKinley's (1996) suggestion and common practice in modern finance[1], we compute the six year real returns r_{6y} as

$$\hat{r}_{6y} = \log(1 + r_{6y}) = \sum_{t \in T(6y)} \log(1 + r_t)$$

where $T(6y)$ is the set of quarters making up the six year period in question. We construct the six-year bond returns $\widehat{rb}_{6y}$ in an analogous way. All statistics reported below and in the main text refer to returns and interest rates defined in this way, as the log of the gross real return.

For wages, we have a time series of annual real wages. We first de-trend this series by a deterministic trend. In our model, wages follow the process

$$w_t = w(z^t)(1 + g)^t$$

and thus

$$\log(w_t) = \log w(z^t) + t * \log(1 + g)$$

Therefore in our data we compute logs of annual real wages and regress them on a constant and a linear time trend. De-trended wages $\hat{w}_t$ are then given by

$$\hat{w}_t = \exp\left(\log(w_t) - t * \log(1 + \hat{g})\right)$$

where we estimate the growth rate of wages in our sample to be $\hat{g} = 1.81\%$. We aggregate de-trended wages into six year wages by simply summing of de-trended annual wages over six year intervals. One final remark about timing of the data is in order. The Campbell data we use extend from 1927 to 1998, which we group into 12 six year intervals. Since our compensation data are only available since 1929, our first wage observation captures only four years which we consequently scale up by a factor of 1.5.

3 Statistics

The six year aggregated data are given in table 1 below. For interpretation again note that asset returns are net returns for six years. For example, between 1993 and 1998 the total real return on bonds was 12.2%.

[1] See, e.g. Campbell (1999) or Campbell (2003). This approach assumes continuous compounding of interest rates.

Table 1: Data Aggregated into Six Year Intervals

Year	Wages $\hat{w}_t$	Bond Ret $\widehat{rb}_t$	Stock Ret. $\hat{r}_t$
1927 – 1933	49.8163	0.4460	−0.2297
1933 – 1938	46.8451	−0.0640	0.9058
1939 – 1944	51.8791	−0.2343	0.1948
1945 – 1950	54.7816	−0.3152	0.3908
1951 – 1956	56.3925	−0.0027	0.9288
1957 – 1962	60.2881	0.0538	0.4290
1963 – 1968	63.1116	0.0864	0.6115
1969 – 1974	64.0737	−0.0285	−0.7169
1975 – 1980	59.1624	−0.0805	0.5779
1981 – 1986	52.8528	0.3045	0.5715
1987 – 1992	49.4080	0.1102	0.4918
1993 – 1998	45.0743	0.1221	0.8979
Mean	54.4738	0.0331	0.4211
Std. Dev.	6.2494	0.2092	0.4842
Coef. Var.	0.1147	6.3129	1.1500
Corr. Coef.	$(\hat{w}, \hat{r}) = -0.38$	$(\hat{w}, \widehat{rb}) = -0.20$	$(\hat{r}, \widehat{rb}) = -0.10$

References

[1] Campbell, J. (1999), "Asset Prices, Consumption and the Business Cycle," in J. Taylor and M. Woodford (eds.), *Handbook of Macroeconomics*, North-Holland, Amsterdam.

[2] Campbell, J. (2003), "Consumption-Based Asset Pricing," in G. Constantinides, M. Harris and R. Stulz (eds.), *Handbook of the Economics of Finance*, North-Holland, Amsterdam.

[3] Campbell, J., A. Lo and C. MacKinlay (1997), *The Econometrics of Financial Markets*, Princeton University Press, Princeton.