Data Appendix for “Tax Changes and Asset Pricing”

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I Data

This appendix explains in detail the exact data sources and the computations used to derive the effective tax yield for the paper “Tax Changes and Asset Pricing.”

A Statutory Tax Rates

The effective tax burden on equity securities depends on the statutory tax rates and on the management style of the stock portfolio. The effective taxes on an equity portfolio can be reduced by holding stocks with low dividend yields, by deferring the realization of capital gains or accelerating the realization of capital losses, and by holding a larger proportion of the assets in tax-qualified environments (for example, pensions and tax-deferred retirement accounts).

The expected taxes paid on a portfolio depend first on the marginal dividend, and short- and long-term capital gains tax rates τ_t^{DIV} , τ_t^{SCG} , and τ_t^{LCG} . Second, the composition of the sources of income from equity investments has also an important impact on the tax burden of a portfolio. Whereas the expected dividend income of portfolio k at time t $DIV_{k,t}$ is taxed at the dividend tax rate, the expected short- and long-term capital gains realizations $SCG_{k,t}$ and $LCG_{k,t}$ are taxed at the corresponding capital gains tax

rates. The total expected tax payments on portfolio k at time t equal:

$$T_{k,t} = \tau_t^{DIV} DIV_{k,t} + \tau_t^{SCG} SCG_{k,t} + \tau_t^{LCG} LCG_{k,t}. \quad (1)$$

The expected tax yield $\kappa_{k,t}$ is defined as the proportion of the prior-year value of the portfolio $P_{k,t-1}$ that is anticipated to be taxed:

$$\begin{aligned} \kappa_{k,t} = \frac{T_{k,t}}{P_{k,t-1}} &= \tau_t^{DIV} \frac{DIV_{k,t}}{P_{k,t-1}} + \tau_t^{SCG} \frac{SCG_{k,t}}{P_{k,t-1}} + \tau_t^{LCG} \frac{LCG_{k,t}}{P_{k,t-1}} \\ &= \tau_t^{DIV} y_{k,t}^{DIV} + \tau_t^{SCG} y_{k,t}^{SCG} + \tau_t^{LCG} y_{k,t}^{LCG}. \end{aligned} \quad (2)$$

The anticipated dividend yield $y_{k,t}^{DIV}$ is defined as the expected taxable dividends divided by the value of the portfolio in the prior year. Similarly, the expected short- and long-term capital gains yields $y_{k,t}^{SCG}$ and $y_{k,t}^{LCG}$ are defined as the proportions of the portfolio values that are anticipated to be realized either as short- or long-term capital gains.

B Statutory Tax Rates

Taxable income is derived for three real income levels expressed after deducting exemptions for a married couple filing jointly with two dependent children from the fixed income levels. The proportion of total deductions relative to the adjusted gross income is assumed to equal the proportion of total deductions in the whole population for each year as reported by the IRS. The marginal income tax brackets and exemptions are determined using the Statistics of Income of the IRS for the years 1913-1943, Joseph A. Pechman (1987) for the years 1944-1987, and different issues of the Instructions to Form 1040 from the IRS for the remaining years between 1988-2006. The values of the Consumer Price Index are taken from the Bureau of Labor Statistics (BLS).¹ Total deductions as a proportion of Adjusted Gross Income (AGI) are derived from different

¹Data can be found at <http://www.bls.gov/cpi/home.htm>.

issues of the Statistics of Income of the IRS. Marginal income tax rates for individuals in two different tax brackets corresponding to AGI levels of \$100,000 and \$250,000 (with 2006 consumer prices), as well as the highest marginal income tax rate are derived. To determine the statutory tax rates, I convert the real income levels into nominal income levels using the Consumer Price Index (CPI). The long-term capital gains tax rate applies to realized gains with a holding period of more than five years. The data source for the capital gains tax rates for 1927-1950 is the Synopsis of Federal Tax Laws from the Statistics of Income for 1950. The remaining tax rates are taken from different issues of the General Explanations of Tax Legislation by the Joint Committee on Taxation (1988-1998) and Table 2-4 from Leonard E. Burman (1999).

C Average Marginal Tax Rates for Taxable Investors

The time series for the average marginal tax rates of dividends and short- and long-term capital gains are hand-collected using different annual issues of the Statistics of Income between 1917 and 1964 and the average marginal tax rates from the NBER between 1965-2006. The IRS did not publish information on the dividend and capital gains distributions between 1913 and 1916. I assume that the income distribution in these years is identical to the published income distribution in 1917. The NBER publishes average marginal tax rates for selected income sources since 1960 using their Taxsim software.²

The NBER publishes average marginal tax rates including state and local taxes since 1979. For the early period, I use the data from the Bureau of the Census and from the National Income and Product Accounts published by the Bureau of Economic Analysis (BEA) to determine the state and local tax rates. The Bureau of the Census publishes the individual income taxes from state and local institutions for selected years since

²I thank Daniel Feenberg for computing some of these time series specifically for this project. Additional information on this model can be found in Daniel Feenberg and Elisabeth Coutts (1993). The time series can be downloaded from <http://www.nber.org/~taxsim>.

1922.³ I use these time series until 1940 to compute the ratio between local and state taxes and federal taxes. For missing years, I impute the state taxes using nearby years. These imputations for missing years should not affect the results much since state and local personal income taxes were relatively small early in the 20th century. After 1940, I use data from the BEA, which summarizes the current personal income tax receipts of state and local governments (Table 3.3) and the federal government (Table 3.2).⁴

I assume that the state and local government tax rate on dividends and capital gains is a fixed proportion of the federal tax rate based on the ratio of the state income tax revenues $T_{state,t}$ relative to federal income tax revenues $T_{federal,t}$. To take into account that states might have differences in the taxation of investment income relative to other income, I also assume that the relative tax rate of state and local governments on dividends and capital gains prior to 1979 is proportional to the relative tax rate of state and local governments in 1979 (the first year where NBER computed the state and local taxes on dividends and capital gains). Thus, the tax rate on dividends (and similarly for short- and long-term capital gains) at the state level prior to 1979 is computed as follows:

$$\tau_{state,t}^{DIV} = \tau_{federal,t}^{DIV} \frac{T_{state,t}}{T_{federal,t}} \left(\frac{\tau_{state,1979}^{DIV} / \tau_{federal,1979}^{DIV}}{T_{state,1979} / T_{federal,1979}} \right) \quad (3)$$

The average imputed tax rate on state taxes on dividends is 7.02 percent of the federal tax rate on dividends. Furthermore, the results in this paper are not affected if state taxes are completely left out and the effective tax rate is just computed for federal taxes, since the two effective tax rates have a correlation coefficient of 99.77 percent.

³The data are available in the series Y658 from the Historical Statistics of the United States Colonial Times to 1970, which can be obtained from:
<http://www2.census.gov/prod2/statcomp/documents/CT1970p2-12.pdf>.

⁴The data can be downloaded from <http://www.bea.gov>.

D Tax-Qualified Investors

Equity securities held in tax-qualified accounts or by tax-exempt institutions are assumed to face zero dividend and capital gains taxes. The average marginal tax rates for dividends and short- and long-term capital gains τ_t^{DIV} , τ_t^{SCG} , and τ_t^{LCG} from equation (2) are computed as the proportion of equities held by taxable investors multiplied by the average marginal tax rates on dividends and capital gains for taxable investors.

The proportion of equity held in taxable accounts is estimated using the Flow of Funds published by the Board of Governors of the Federal Reserve System.⁵ The proportion is only computed for equities held by domestic investors, since it is impossible to determine the marginal tax rates faced by international stock investors. The Flow of Funds publishes this distribution of equity holdings only between 1945 and 2006. The values prior to 1945 are taken from 1945. The proportion of tax-qualified equities is computed similarly as McGrattan and Prescott (2005) as the ratio between corporate equity held by domestic tax-qualified investors and the total corporate equity held (Flow of Funds variable FL893064105) minus the total corporate equity held by the rest of the world (FL263064003). The total corporate equity held by tax-qualified domestic investors has three main components: (1) private and public pension plans; (2) Individual Retirement Accounts (IRA); and (3) nonprofits. The pension plan equity holdings consist of the total pension plan equity holdings held directly by private pension plans (FL573064105), by state and local government pension plans (FL223064105), and by federal government pension plans (FL343064105). Furthermore, these pension plans hold equity securities indirectly through pass-through entities such as mutual funds. The Flow of Funds accounts give the holdings of mutual funds held by pension plans (FL573064203 and FL223064203). The equity share of these mutual funds is estimated by dividing the aggregate corporate equity held by mutual funds (FL653064000) by the total assets held by mutual funds (FL653164005). The Flow of Funds gives data on the

⁵The data can be downloaded from <http://www.federalreserve.gov/releases/Z1/>.

total assets held in IRAs (FL893131573). However, the Flow of Funds do not indicate which proportion of the IRA holdings are equity holdings. To determine the equity holdings in IRAs, I assume that the proportion of equity held in IRAs equals the overall proportion of equity held by mutual funds. This imputed proportion closely corresponds to the proportion of equity in IRAs from the Survey of Consumer Finances (SCF) conducted every three years between 1989 and 2001. On average, mutual funds held 55 percent equity securities according to the Flow of Funds and households in the SCF held 54 percent equity in their IRAs. Both sources indicate a relatively large increase in the equity holdings over the sample period. Finally, the Flow of Funds publishes the corporate equities (FL163064105) and the mutual funds (FL163064205) held by non-profits between 1987 and 2000. The proportion of equity held by non-profits in mutual funds is again assumed to equal the aggregate proportion of equity held by mutual funds. Using this data, I compute the proportion of the aggregate equity held by non-profits for these years. For the remaining years with missing data, I impute the equity proportion held by non-profits to equal the average between 1987 and 2000, which equals 7.9 percent. The proportion of equity held by non-profits in these years is relatively stable and ranges between 6.7 and 9.4 percent.

E Aggregate Capital Gains Yields

The annual Statistics of Income of the IRS report the total short- and long-term capital gains and the dividends declared by individuals between 1917 and 2004. The capital gains given by the Statistics of Income include capital gains from many sources and not just from stock transactions. The IRS does unfortunately not report every year the proportion of capital gains that result from transactions of corporate equities. However, for eight years between 1959 and 2004, the IRS reports the sources of capital gains in more detail. On average, about 35 percent of the capital gains result from transactions of corporate equity. I interpolate the fraction of stock capital gains using these eight

years.

The IRS reports the dollar amount of dividends $DIV_{IRS,t}$ and short- and long-term capital gains $SCG_{IRS,t}$ and $LCG_{IRS,t}$ declared on tax forms. However, the IRS does not report the value of the total taxable assets. I compute the actual short- and long-term capital gains yields $y_{IRS,t}^{SCG}$ and $y_{IRS,t}^{LCG}$, by multiplying the value-weighted dividend yield $y_{M,t}^{DIV}$ of the aggregate stock market (either S&P Composite Index or CRSP value-weighted index) with the ratio between the short- and long-term realized capital gains $SCG_{IRS,t}$ and $LCG_{IRS,t}$ divided by the total dividend payments $DIV_{IRS,t}$:

$$y_{IRS,t}^{SCG} = y_{M,t}^{DIV} \frac{SCG_{IRS,t}}{DIV_{IRS,t}}, \quad (4)$$

$$y_{IRS,t}^{LCG} = y_{M,t}^{DIV} \frac{LCG_{IRS,t}}{DIV_{IRS,t}}. \quad (5)$$

I assume that investors anticipate to realize a fixed proportion of capital gains out of the total expected returns net of expected dividend payments. Thus, investors expect to realize larger capital gains for stock portfolios that are anticipated to pay smaller dividend yields. The average market return (either S&P Composite Index or CRSP value-weighted index) is given by $\bar{r}_M$.⁶ The time-series of capital gains yields used to compute the tax yield in equation (2) are assumed as follows:

$$y_{k,t}^{SCG} = \bar{y}_{IRS}^{SCG} \frac{\bar{r}_M - y_{k,t}^{DIV}}{\bar{r}_M - \bar{y}_M^{DIV}} = \frac{\bar{y}_{IRS}^{SCG} \bar{r}_M}{\bar{r}_M - \bar{y}_M^{DIV}} - \frac{\bar{y}_{IRS}^{SCG}}{\bar{r}_M - \bar{y}_M^{DIV}} y_{k,t}^{DIV} = \eta_0^{SCG} - \eta_1^{SCG} y_{k,t}^{DIV}, \quad (6)$$

$$y_{k,t}^{LCG} = \bar{y}_{IRS}^{LCG} \frac{\bar{r}_M - y_{k,t}^{DIV}}{\bar{r}_M - \bar{y}_M^{DIV}} = \frac{\bar{y}_{IRS}^{LCG} \bar{r}_M}{\bar{r}_M - \bar{y}_M^{DIV}} - \frac{\bar{y}_{IRS}^{LCG}}{\bar{r}_M - \bar{y}_M^{DIV}} y_{k,t}^{DIV} = \eta_0^{LCG} - \eta_1^{LCG} y_{k,t}^{DIV}. \quad (7)$$

F Effective Tax Rate

Based on these assumptions, it is possible to derive effective tax yields for different portfolios according to equation (2). The tax yield depends primarily on the dividend

⁶To avoid a potential spurious correlation between the tax yield and the portfolio return, I adjust the tax yield coefficient by using the average market return $\bar{r}_M$ instead of the average return of a specific portfolio $\bar{r}_k$. This assumption does not affect the results substantially.

yield and the dividend and capital gains tax rates:

$$\begin{aligned}\kappa_{k,t} &= \tau_t^{DIV} y_{k,t}^{DIV} + \tau_t^{SCG} y_{k,t}^{SCG} + \tau_t^{LCG} y_{k,t}^{LCG} \\ &= y_{k,t}^{DIV} \left(\tau_t^{DIV} - \eta_1^{SCG} \tau_t^{SCG} - \eta_1^{LCG} \tau_t^{LCG} \right) + \eta_0^{SCG} \tau_t^{SCG} + \eta_0^{LCG} \tau_t^{LCG}.\end{aligned}\quad (8)$$

G Taxable Dividends

For the cross-sectional results based on CRSP data, I compute dividend yields using only taxable dividends, which have the following CRSP distribution codes: 1200, 1202, 1212, 1218, 1222, 1228, 1232, 1231, 1238, 1239, 1242, 1248, 1252, 1258, 1262, 1268, 1272, 1278, 1279, 1282, 1292, 1312, 1318, 1332, 1338, 1342, 1348, 1352, 1362, 1368, 1372, 1378, 1412, 1418, 1438, 1712, 1718, 1772, 1812, 1818, 1872, and 1999.

H Macroeconomic Data

The S&P Composite Index, the corresponding dividend and earnings variables, the interest rate, and the CPI series between 1871 and 2006 are taken from Robert Shiller's webpage and correspond to the December values from the monthly data series.⁷ The interest rate is based on Shiller's annual data and captures the annual compounded yield of 6-month Commercial Paper rates until August 1997 and the 6-month Certificate of Deposit rate after that.⁸ Shiller's website only lists interest rates until 2004. The data for 2005 and 2006 are computed using the Federal Reserve Board's 6-month Certificates of Deposit (secondary market) by compounding the rates in January and December.⁹ The rate of inflation is based on the CPI.

The equity Q is obtained from Stephen Wright (2004) between 1900 and 1951 and from the Federal Reserve Board's Flow of Funds Accounts between 1952 and 2006. The

⁷According to S&P the earnings data are reported earnings and include "all charges except for discontinued operations and extraordinary items, as defined by GAAP." See for additional information: <http://www2.standardandpoors.com/spf/pdf/index/Earnings%20Measures.pdf>.

⁸See <http://www.econ.yale.edu/~shiller/data.htm> for the data sources.

⁹The data are obtained from <http://www.federalreserve.gov/releases/h15/data.htm>.

equity Q from the Flow of Funds is based on Table B.102 (Balance Sheet of Nonfarm Nonfinancial Corporate Business) and is defined as the ratio between the market value of equities outstanding of nonfinancial corporate business (FL103164003) and the net worth at market value of nonfarm nonfinancial corporate business (FL102090005).¹⁰ The net worth at market value is defined as the market value of all assets minus the liabilities. It uses the values for the fourth quarter in each year since 1952. The correlation between the values in Wright (2004) and the Flow of Funds computations equals 99.71 percent over the overlapping period between 1952 and 2002.¹¹

The nominal output growth rate is computed using the growth rate in the GNP from Brian R. Mitchell (1983) prior to 1928 and the growth rate in the GDP from the BEA (Table 1.1 Line 1) for the remaining years. The U.S. population prior to 1940 is taken from Donald B. Dodd (1993) and after 1939 from the BEA (Table 8.7 Line 16). The per capita growth rate is computed as the relative change in the nominal output divided by the U.S. population.¹²

The corporate quality and term spreads are computed based on data on the averages of the monthly yields of corporate securities obtained from the Federal Reserve over the period between 1919-2006.¹³ The quality spread is defined as the difference between the yields on Baa and Aaa corporate bonds. The term spread is defined as the difference between the yields on Aaa corporate bonds and one-year interest rate on commercial paper by Shiller as described above.

Stock participation is defined as the proportion of households that obtain dividend

¹⁰The corporate farm sector is included in the numerator but excluded from the denominator. However, the corporate farm sector is very small as discussed by Wright (2004).

¹¹The average equity Q equals 0.673 and is significantly smaller than 1. This occurs because the denominator of the Equity Q corresponds to the net worth at market value and not the net worth at historical cost. The ratio between the market value of equities outstanding of nonfinancial corporate business (FL103164003) and the net worth at historical cost of nonfarm nonfinancial corporate business (FL102090115) has a mean of 1.19 between 1952 and 2006. The correlation of this ratio with the Equity Q used in the paper equals 0.98.

¹²Data from the BEA can be accessed at <http://www.bea.gov> and the party of the president can be found on <http://www.whitehouse.gov/history/presidents/>.

¹³The data are available at <http://www.federalreserve.gov/releases/h15/data.htm>.

payments according to IRS data. It is computed as the ratio between the total number of tax returns with dividends according to the annual Statistics of Income of the IRS divided by the number of households in the U.S., which is obtained from the Census. Prior to 1947, the number of households is only reported every ten years and is linearly interpolated between reporting dates.

Government expenditures to GDP prior to 1929 are based on the Historical Statistics of the United States Colonial Times to 1970 Part I, 232 Series F 216-225 and after 1928 on the Bureau of Economic Analysis' Current Government Expenditures (Table 3.1) Divided by Gross Domestic Product (Table 1.1.5).

Finally, the top corporation tax rate is obtained from Pechman (1987) until 1985 and the IRS for subsequent years.

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