

Global Taxation Regimes:

- **Taxes on Income:** Taxes paid by Individual, corporations and other legal entities on income from wages, dividends, interest and capital gains.
- **Taxes on Wealth:** Taxes paid on wealth held and on wealth transfers.
- **Taxes on Consumption:**
 - Sales taxes
 - Value added taxes VAT; paid at each intermediate production process where value has been added; Added totally to the finally product costs.

Governments add taxes as source of funding and to encourage or discourage certain activities; examples include favorable taxes on savings for retirement.

Tax regimes are either progressive or flat. In flat rate system taxes are flat irrespective of incomes earned. Where as in progressive tax regimes tax rates increase as income increases. Tax rate paid on highest dollar of income is called marginal tax rate.

Most common tax regimes is "Common Progressive" tax regimes where income is taxed at progressive rate and have favorable tax treatment for interest, dividend and capital gains.

Other types of tax regimes are "Heavy Dividend Tax", "Heavy Capital Gain Tax", "Light Capital Gain Tax" and Heavy Interest Tax" regimes, where ordinary income tax is at progressive rate and other taxes are either heavy or light tax according to the type.

Also there is "Flat and light" tax regime, where ordinary income is at progressive rate and all other taxes are at favorable tax rates. At "Flat and heavy" rate system ordinary income is at flat rate and interest income is at favorable rate except dividend and capital gain taxes.

Accrual taxes: paid periodically (say annually), If T_1 is annual tax rate R is rate of return before tax then future value of investment factor after taxes is

$$FVIF_{IT} = [1 + R (1 - T_1)]^N$$

The gain lost to taxes during the compounded period is called tax drag or in percentage terms is called tax drag percentage.

If returns are positive, periodic taxes paid during the time horizon in accrual taxes scenario:

1. Tax drag > Tax rate
2. When investment horizon increases Tax drag > Tax rate
3. As rate of return increases Tax drag > tax rate

Deferred Capital Gain Taxes:

Unlike accrual taxes, Capital gains are deferred until assets are sold. Investment grows tax free until assets are sold. (In general capital gains taxes are lesser than ordinary income taxes). If capital Gain Taxes are T_{CG} , after tax future value investment factor for deferred capital gains is

$$FVIF_{CG} = [(1 + R)^N (1 - T_{CG}) + T_{CG}]$$

In case deferred capital gains

1. Tax drag = Tax rate
2. As investment horizon increases Tax drag is unchanged
3. Investment return increases Tax drag will not change.

When taxes are deferred:

4. As investment horizon increases tax deferral increases.
5. As investment return increases tax deferral increases.

Cost Basis: If the present value of the investment has unrealized capital gains, then the ratio of original investment value to present value is called basis (B). If the cost of initial investment is \$700 and present value is used in Capital gains calculation is \$1000, then the basis (B) is 0.7.

In this case Future value is reduced by basis,

$$FVIF_{CG \text{ MV} < \text{basis}} = [(1 + R)^N (1 - T_{CG}) + T_{CG}] * B.$$

Wealth Based Taxes: Taxes are based on wealth and is paid annually; example is Real estate tax is imposed on total wealth that is on investment and appreciation.

$$FVIF_{WT} = [(1 + R) (1 - T_w)]^N$$

In case of wealth taxes:

- Tax drag increases as investment horizon increases.
- As investment return increases tax drag decreases.

Cumulative Effect of Investment Taxes:

In an investment horizon there are interest gains P_I , dividend gains P_D , and capital gains P_{CG} and unrealized gains.

Total realized taxes rate is $= (P_I * T_I + P_D * T_D + P_{CG} * T_{CG})$.

Realized after Tax returns $R_{ART} = R (1 - \text{realized tax rate})$

$$= R ([1 - (P_I * T_I + P_D * T_D + P_{CG} * T_{CG})])$$

Effective capital gains tax after adjusting annual taxes already paid for interest, dividends, and capital gains are

$$T_{ECG} = T_{CG} \left[\frac{1 - (P_I + P_D + P_{CG})}{(P_I T_I + P_D T_D + P_{CG} T_{CG})} \right]$$

If Return after realized taxes R_{ART} , and effective deferred capital gains tax T_{ECG} , then future value of investment factor with cost basis is :

$$FVIF_T = [(1 + R_{ART})^N (1 - T_{ECG}) + T_{ECG} - (1 - B) T_{CG}]$$

Accrual Equivalent After-Tax Return:

Accrual equivalent after tax return is annual return that produces same terminal value of taxable portfolio.

$$FV = PV (1 + r)^n$$

If Accrual equivalent return is R_{AE} , the $FV_T = PV (1 + R_{AE})^N$

$$R_{AE} = \left(\frac{FV}{PV} \right)^{\frac{1}{N}} - 1.$$

Accrual Equivalent tax rates:

$$R_{AE} = R (1 - T_{AE}) \Rightarrow$$

$$T_{AE} = 1 - \frac{R_{AE}}{R}$$

Account Tax Profiles:

There are couple of tax advantaged accounts, Tax deferred and Tax Exempt accounts.

In **Tax Deferred** accounts, contributions reduce tax payer's current taxes and returns on contributions grow tax free, but taxed while funds are with drawn in future.

In **Tax Exempt** accounts, contributions are made from after tax funds and funds withdrawn in future are tax free, and said to have back-end tax benefits.

Tax and Investment Risk: If investments are held in an account that taxed annually, government bears part of the investment risk, since government benefits from investment

returns. If tax rate is T and standard deviation of pre tax return is σ then investors after tax risk is $T(1 - \sigma)$.