1. INTRODUCTION

The major objective of private wealth managers is to maximize after-tax wealth of a client consistent with his/her risk tolerance and portfolio constraints. Taxes (particularly for high-net-worth individuals) tend to have a substantial impact on the net performance of the portfolio.

2. OVERVIEW OF GLOBAL INCOME TAX STRUCTURES

Tax structures: The rules that specify how and when different types of income are taxed by the government are called tax structures. Such rules are determined by national, regional, and local jurisdictions. Tax structures vary among countries depending on the funding needs and objectives of the governments. Hence, it is necessary for investment advisors to understand the impact of different tax structures on portfolio returns.

Sources of Tax Revenue for a government:

Major sources of government tax revenue include:

1) **Taxes on income:** These refer to taxes charged on income, including salaries, interest, dividends, realized capital gains, and unrealized capital gains etc. These taxes are applied to individuals, corporations, and other types of legal entities.
2) **Wealth-based taxes:** Taxes charged on holdings of certain types of property (e.g. real estate) and taxes charged on transfer of wealth (e.g. taxes on inheritance) are called wealth-based taxes.
3) **Taxes on consumption:** Taxes on consumption include:

- **Sales taxes:** Taxes charged on the price of a final good/service are called sales taxes. They are applied to final consumers in the form of higher price of goods/services.
- **Value-added taxes:** Taxes charged on the price of an intermediate good/service are called value-added taxes. They are also borne by the final consumers in the form of higher price of goods/services.

2.2 Common Elements

A tax structure applies to various incomes including:

- Ordinary income i.e. earnings from employment.
- Investment income (also known as capital income): It includes interest, dividends, or capital gains/losses.
  - o Typically, long-term capital gains are taxed at favorable rates compared to short-term capital gains.

Types of Tax Structures:

A. Progressive rate tax structure: In a progressive rate tax structure, the tax rate increases with an increase in income i.e. people who earn higher income pay a higher tax rate. It is the *most common structure*.

Example:

Taxable Income $		Tax on	Percentage on Excess
Over	Up to	Column 1	Over Column 1
0	10,000	---	20
10,000	23,000	0.20 (10,000) = 2,000	25
23,000	50,000	0.25 (23,000 –10,000) =3,250 • 3,250 + 2,000 = 5,250	35
50,000	70,000	0.35 (50,000 -23,000) = 9,450 • 9,450 + 5,250 = 14,700	38
70,000		0.38 (70,000 – 50,000) = 7,600 • 7,600 + 14,700 = 22,300	40

Suppose, an individual has taxable income of $65,000, then the amount of tax due on taxable income will be as follows:

$14,700 + ((65,000 – 50,000) × 0.38) = $14,700 + $5,700
= $20,400

Average tax rate = Total taxes paid / Total taxable income

Average tax rate = $20,400 / $65,000 = 31.38%

Marginal tax rate: Tax rate paid on the highest dollar of income is called marginal tax rate.

Marginal tax rate = 38%

B. Flat rate tax structure: In a flat rate tax structure, all taxable income is taxed at the same rate, regardless of income level.

Practice: Example 1, Volume 2, Reading 11.

2.3 General Income Tax Regimes

CLASSIFICATION OF INCOME TAX REGIMES

Regime	1–Common Progressive	2–Heavy Dividend Tax	3–Heavy Capital Gain Tax	4–Heavy Interest Tax	5–Light Capital Gain Tax	6–Flat and Light	7–Flat and Heavy
Ordinary Tax Rate Structure	Progressive	Progressive	Progressive	Progressive	Progressive	Flat	Flat
Interest Income	Some interest taxed t favorable rates or exempt	Some interest taxed t favorable rates or exempt	Some interest taxed t favorable rates or exempt	Taxed at ordinary rates	Taxed at ordinary rates	Some interest taxed t favorable rates or exempt	Some interest taxed t favorable rates or exempt
Dividends	Some dividends taxed t favorable rates or exempt	Taxed at ordinary rates	Some dividends taxed t favorable rates or exempt	Some dividends taxed t favorable rates or exempt	Taxed at ordinary rates	Some dividends taxed t favorable rates or exempt	Taxed at ordinary (flat) rates
Capital Gains	Some capital gains taxed favorably or exempt	Some capital gains taxed favorably or exempt	Taxed at ordinary rates	Some capital gains taxed favorably or exempt	Some capital gains taxed favorably or exempt	Some capital gains taxed favorably or exempt	Taxed at ordinary (flat) rates
	Most common Tax regime		Least common Tax regime		Second most common Tax regime		

3. AFTER-TAX ACCUMULATIONS AND RETURNS FOR TAXABLE ACCOUNTS

Taxes on investment returns have a significant impact on the portfolio performance and future accumulations; hence, investors should evaluate returns and wealth accumulations of different types of investments subject to different tax rates and methods of taxation.

The effect of taxes on investment returns depends on the following factors:

- Tax rate
- Return on investment
- Frequency of payment of taxes

There are two types of methods of taxation:

1) Accrued taxes on interest and dividends that are paid annually.
2) Deferred capital gain taxes.

3.1.1) Returns-Based Taxes: Accrued Taxes on Interest and Dividends

Accrual taxes are taxes that are levied and paid on a periodic basis, usually annually. Under accrual taxation method,

$$\text{After-tax return} = \text{Pre-tax return} \times (1 - \text{tax rate applicable to investment income}) = r \times (1 - t_i)$$

$$\text{After-tax Future Accumulations after n years} = FVIF_i = \text{Initial investment value} \times (1 + r(1 - t_i))^n$$

$$\text{After-tax investment gain} = \text{Pretax investment gain} \times (1 - \text{tax rate})$$

Tax Drag on capital accumulation: Reduction in after-tax returns on investment due to taxes during the compounded period is called tax drag.

Tax drag ($) on capital accumulation = Accumulated capital without tax – Accumulated capital with tax

Tax drag (%) on capital accumulation = (Accumulated capital without tax – Accumulated capital with tax) / (Accumulated capital without tax – Initial investment)

Example: Suppose, an investor invested $150 at 6.5% per annum for 10 years. The returns are taxed annually at the tax rate of 30%. Then,

$FVIF_i = \$150 \times (1 + 0.065\ (1 - 0.30))^{10}$
$= \$234.06$

In the absence of taxes on returns,
$FVIF_i = \$150 \times (1 + 0.065\ (1 - 0.00))^{10}$
$= \$281.57$

Tax drag ($) on capital accumulation = ($281.57 – $234.06)
= $47.51

Tax drag (%) on capital accumulation= ($281.57 – $234.06) / ($281.57 – $150)
= $47.51 / $131.57
= 0.3611
= 36.11% ➔This rate is greater than the ordinary income tax rate.

When investment returns are subject to accrued taxes on an annual basis (assuming returns are positive):

- The tax drag is greater than the nominal tax rate.
- Tax drag and investment time horizon (n) are positively correlated i.e. as the investment horizon (n) increases, tax drag increases, all else equal.
- Tax drag and investment returns (r) are positively correlated i.e. as the investment return increases, tax drag increases, all else equal.
- The investment return and time horizon have a multiplicative effect on the tax drag i.e.
  - Given investment returns, the longer the time horizon, the greater the tax drag.
  - Given investment time horizon, the higher the investment returns, the greater the tax drag.

Practice: Example 2, Volume 2, Reading 11.

3.1.2) Returns-Based Taxes: Deferred Capital Gains

Deferred capital gain taxes are taxes that are postponed until the end of the investment horizon. Under deferred capital gain tax, investment grows tax free until assets are sold.

After-tax Future Accumulations after n years = $FVIF_{cg}$ = Initial Investment × $((1 + r)^n (1 - t_{cg}) + t_{cg})$

Where,

t_{cg} = Capital gain tax rate

- t_{cg} is added as it is assumed that initial investment is made on an after-tax basis and is not subject to further taxation.

Value of a capital gain tax deferral = After-tax future accumulations in deferred taxes – After-tax future accumulations in accrued annually taxes

Example:

Suppose, an investor invested $150 at 6.5% per annum for 10 years. The returns are taxed at the end of investment horizon at tax rate of 30%. Then,

$FVIF_i = \$150 \times ((1 + 0.065)^{10} (1 - 0.30) + 0.30)$
$= \$242.099$
Value of a capital gain tax deferral = $242.099 – $234.06
= $8.039

A deferred capital gain environment accumulates $242.099/$234.06 = 1.034 times the amount accumulated in an annual taxation environment.

In the absence of taxes on returns,

$FVIF_i = \$150 \times (1 + 0.065\ (1 - 0.00))^{10} = \$281.57$

Tax drag (%) on capital accumulation = ($281.57– $242.099) / ($281.57 – $150)
= $39.471 / $131.57
= 0.30
= 30% ➔ same as the tax rate.

When taxes on capital gains are deferred until the end of investment horizon:

- Tax drag = Tax rate.
- Tax drag is a fixed percentage irrespective of investment return or time horizon i.e. as investment horizon and/or time horizon increases → Tax drag is unchanged.
- The value of a capital gain tax deferral is positively correlated with the investment returns and time horizon i.e. the higher the investment returns and/or the longer the investment time horizon, the greater the value of a capital gain tax deferral.
- Even if marginal tax rate on the investments taxed on a deferred capital gain basis is equal to or

greater than the marginal tax rate on the investments with returns that are taxed annually, after-tax future accumulations of investments taxed on a deferred capital gain basis will be greater than that of investments with returns that are taxed annually, all else equal.
  - In addition, when marginal tax rate on the investments taxed on a deferred capital gain basis < marginal tax rate on the investments with returns that are taxed annually ➔ investor will benefit from deferral of taxation as well as favorable tax rate when gains are realized.
- The investment return and time horizon have a multiplicative effect on the value of a capital gain tax deferral i.e.
  - Given investment returns, the longer the time horizon, the greater the advantage of tax deferral.
  - Given investment time horizon, the higher the investment returns, the greater the advantage of tax deferral.

Implication: *Investments taxed on a deferred capital gain basis are more tax-efficient than investments with returns that are taxed annually.*

IMPORTANT TO NOTE:

However, the advantages of tax deferral may be offset or even eliminated when the securities whose returns are taxed annually on an accrual basis have higher risk-adjusted returns.

Practice: Example 3, Volume 2, Reading 11.

3.1.3) Cost Basis

For tax purposes, cost basis refers to the amount paid to purchase an asset.

Capital gain/loss = Selling price – Cost basis

- The cost basis and capital gain taxes are inversely related i.e. as the cost basis decreases, the taxable capital gain increases ➔ consequently, capital gain tax increases.
- Thus, the lower the cost basis → the greater the tax liability → the lower the future after-tax accumulation, all else equal.

After-tax Future Accumulation = $FVIF_{cgb}$
= Initial investment × ((1 + r) ^{n} (1 – t_{cg}) + t_{cg} – (1 – B) t_{cg})
=Initial investment × ((1 + r) ^{n} (1 – tcg) + (tcg × B))

Where,

B = Cost basis expressed as a proportion of current market value of the investment.
tcg × B = Return of basis at the end of the investment horizon. The lower the cost basis, the lower is the return of basis.
When cost basis = initial investment ➔ B = 1,
$FVIF_{cg}$ = Initial investment × ((1 + r) ^{n} (1 – t_{cg}) + t_{cg})

Example:

Suppose, the current market value of investment is $100 and a cost basis is 75% of the current market value (or $75). Capital gain tax rate is 25%. The investment is expected to grow at 5% for 10 years.

Since B = 0.75,
After-tax Future Accumulation = $100 ((1.05)^{10} (1 – 0.25) + (0.25) (0.75))
= $140.917

If B = 1,
After-tax Future Accumulation = $100 ((1.05)^{10} (1 – 0.25) + (0.25))
= $147.1671

Tax liability associated with embedded capital gains
= $147.1671 – $140.917
= $6.2501.

NOTE:

Step-up in Basis: Under step-up in basis, the value of the inherited property on the date of death is used as a cost basis for calculating any future capital gains or losses.

Practice: Example 4, Volume 2, Reading 11.

3.1.4) Wealth-Based Taxes

Unlike capital gains or interest income taxes, wealth taxes apply on the entire capital base (i.e. principal + return); thus, the wealth tax rate tends to be lower compared to capital gains or interest income.

After-tax Future Accumulation = $FVIF_{w}$ = Initial Investment ((1 + r) (1 – t_{w})) ^{n}

Where,

t_{w} = Annual wealth tax rate

- Tax drag (%) is greater than the nominal tax rate.
- As investment returns increase (decrease), the tax drag (%) associated with wealth tax decreases (increases).
- However, as the investment returns increase (decrease), the tax drag ($) associated with wealth

tax increases (decreases).
- When investment returns are flat or negative, a wealth tax tends to decrease principal.
- The tax drag (both % & $) associated with wealth tax is positively correlated to investment horizon i.e. as investment horizon increases (decreases), the reduction in investment growth caused by wealth tax increases (decreases).

Example:

Suppose, an investor invests $100 at 5% for 10 years. The wealth tax rate is 2.5%.

$$FVIF_w = \$100\ ((1.05)\ (1 - 0.025))^{10} = \$126.4559$$

Practice: Example 5, Volume 2, Reading 11.

3.2 Blended Taxing Environments

Investment Portfolios are subject to different taxes. These taxes depend on the following factors:

- Types of constituent securities
- Frequency of trading of constituent securities
- Direction of returns

Components of Portfolio's investment return:

a) Proportion of total return from Dividends (p_d) which is taxed at a rate of t_d.

p_d = Dividends ($) / Total dollar return

b) Proportion of total return from Interest income (p_i) which is taxed at a rate of t_i.

p_i = Interest ($) / Total dollar return

c) Proportion of total return from Realized capital gain (p_{cg}) which is taxed at a rate of t_{cg}.

p_{cg} = Realized Capital gain ($) / Total dollar return

d) Unrealized capital gain return: The tax on unrealized capital gain is deferred until the end of investment horizon.

Total Dollar Return = Dividends + Interest income + Realized Capital gain + Unrealized capital gain

➔Unrealized capital gain = Total Dollar Return – Dividends – Interest income - Realized Capital gain

Total realized tax rate = $((p_i \times t_i) + (p_d \times t_d) + (p_{cg} \times t_{cg}))$

Effective Annual After-tax Return: It is calculated as follows:

$r^* = r\ (1 - p_i t_i - p_d t_d - p_{cg} t_{cg}) = r\ (1 - \text{total realized tax rate})$

Where,

r = Pre-tax overall return on the portfolio
r* = Effective annual after-tax return

- It must be stressed that effective annual after-tax return only reflects that the negative effects of taxes apply to dividends, interest and realized capital gains; it does not reflect tax effects of deferred unrealized capital gains.

Effective Capital Gains Tax:

Effective Capital Gain Tax = $T^* = t_{cg}\ (1 - p_i - p_d - p_{cg}) / (1 - p_i t_i - p_d t_d - p_{cg} t_{cg})$

- The more (less) accrual tax is paid annually, the lower (greater) the deferred taxes.

Future after-tax accumulation:

$FVIF_{Taxable}$ = Initial investment $((1 + r^*)^n\ (1 - T^*) + T^* - (1 - B)\ t_{cg})$

- When an investment is only subject to ordinary tax rates and has no capital appreciation or depreciation over the tax year period:
  - o pi = 1
  - o pd = 0
  - o pcg = 0

  If the cost basis = market value ➔ B = 1.

  Future After-tax accumulation = $(1 + r\ (1 - t_i))^n$

- For a ***Passive*** investor with ***Growth portfolio*** consisting of ***non-dividend*** paying stocks and no portfolio turnover:
  - o $p_d = 0$
  - o $p_i = 0$
  - o $p_{cg} = 0$

  Future After-tax accumulation = $(1 + r)^n\ (1 - t_{cg}) + t_{cg}$

- For an ***Active*** investor with ***Growth portfolio*** consisting of realized long-term capital gains:
  - o $p_d = p_i = 0$
  - o $p_{cg} = 1$

  Future After-tax accumulation = $(1 + r\ (1 - t_{cg}))^n$

NOTE:

Deferred capital gains tax only postpones the payment of tax at the end of the investment horizon; it does not eliminate the tax liability.

Example:

Suppose,

- Beginning value of portfolio = $100,000.
- Investment horizon = N = 5 years.
- Ending pretax value of portfolio after one year = $110,000.
- Cost basis = $100,000.
- Additional data is given in the table below.

Total dollar return = $110, 000 – $100,000 = $10,000
Pretax Total return = 10,000 / 100,000 = 10%

Income Type	Income Amount ($)	Tax Rate	Tax Due ($)	Annual Distribution Rate (p)
Interest	500	35	175	500/10,000 = 5%
Dividends	1,800	15	270	1800 / 10,000 = 18%
Realized capital gains	3,700	15	555	3700 / 10,000 = 37%
Total tax due			1000	

Unrealized capital gains = $10,000 – $500 – $1,800 – $3,700 = $4000

- Total tax due (i.e. $t_d + t_i + t_{cg}$) = $1000.
- Ending after-tax value of portfolio after one year = $110,000 - $1000 = $109,000.

A. The effective annual after-tax return at the end of 1st year is estimated as follows:

r* = 10% (1 – (0.05 × 0.35) – (0.18 × 0.15) – (0.37 × 0.15))
= 9%

OR

FV = $109,000.
N = 1
PV = –$100,000.
PMT = 0

CPT→**I/Y = 9.00% = Effective annual after-tax return**

B. Effective capital gains tax rate:

T* = 0.15 ((1 – 0.05 –0.18 – 0.37) / (1 – (0.05 × 0.35) – (0.18 × 0.15) – (0.37 × 0.15))
= 6.67%

C. Future after-tax accumulation over 5 years:

FVIF Taxable = $100,000 ((1.09) ^{5} (1 – 0.0667) + 0.0667 – (1 – 1.00) 0.15)
= $150,270.

Practice: Example 6, 7 & 8, Volume 2, Reading 11.

3.3 Accrual Equivalent Returns and Tax Rates (Section 3.3.1)

Accrual equivalent after-tax return is the hypothetical ***tax-free return*** that produces the future value of a portfolio equivalent to the future value of a taxable portfolio. It incorporates the effect of both realized annual taxes and deferred taxes paid at the end of holding period.

Initial Investment (1 + Accrual Equivalent Return)^n
= Future After-tax Accumulations

Accrual Equivalent Return = (Future After-tax Accumulations / Initial Investment) $^{1/n}$ – 1

- *The accrual equivalent return is always less than the taxable return.*
- *As the time horizon increases, the accrual equivalent return approaches pretax return due to increase in value of tax deferral over time.*
- *The greater the proportion of deferred capital gains in the portfolio, the greater the value of tax deferral.*

Example:

In the previous example, an investment portfolio has beginning value of $100,000 and the future after-tax value after 5 years is $150,270.

$100,000 (1 + Accrual Equivalent Return)^5
= $150,270

Accrual Equivalent Return = 8.49%
Tax drag = Taxable return – Accrual equivalent return = 10% – 8.49% = 1.51%

3.3.2) Calculating Accrual Equivalent Tax Rates

Accrual equivalent tax rate (T_{AE}) is the hypothetical tax rate that produces an after-tax return equivalent to the accrual equivalent return.

$r (1 – T_{AE}) = R_{AE}$

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

- The greater the proportion of income subject to ordinary tax rates or if dividends and capital gains are subject to less favorable tax rate ➔ the higher the accrual equivalent tax rate and consequently, the smaller the accrual equivalent return.
- The higher (lower) the cost basis, the lower (higher) the accrual equivalent tax rate.
- Given cost basis, the longer (shorter) the investment horizon, the lower (higher) the accrual equivalent

tax rate.

Uses of the accrual equivalent tax rate:

1) To measure the tax efficiency of different asset classes or portfolio management styles i.e. the lower (higher) the accrual equivalent tax rate, the more (less) tax-efficient the investment.
2) To assess the tax impact of increasing the average holding periods of securities.
3) To assess the impact of future changes in tax rates e.g. due to changes in tax law, changes in client circumstances etc.

Practice: Example 9, Volume 2, Reading 11.

4. TYPES OF INVESTMENT ACCOUNTS

The impact of taxes on future accumulations considerably depends on the type of investment account in which assets are held.

Investment accounts can be classified into the following three categories:

1. **Taxable accounts:** In taxable accounts, investments are made on an ***after-tax basis*** and returns can be taxed in different ways.
2. **Tax Deferred accounts (TDAs):** In tax deferred accounts:

- Contributions are made on a pretax basis (i.e. tax deductible); and
- The investment returns grow tax free until the time of withdrawal at which time withdrawals are taxed at ordinary rates or another rate (T_n), prevailing at the end of the investment horizon.
  Future after-tax accumulation = FVIF $_{TDA}$ = Initial Investment ((1 + r) ^{n} (1 – T_n))
- Due to deferred taxes, tax deferred accounts provide ***front-end loaded tax benefits*** to investors.
- In TDAs, investors are sometimes allowed to make tax free distributions.

3. **Tax-exempt accounts:** In tax-exempt accounts:

- Contributions are not tax deductible i.e. they are made on after-tax basis.
- Investment returns grow tax-free and withdrawal of investment returns in the future are NOT subject to taxation i.e. withdrawals are tax exempt.
  FVIF $_{taxEx}$ = Initial Investment (1 + r) ^{n}
- Due to tax free withdrawals of investment returns at the end of time horizon, tax-exempt accounts provide ***back-end loaded tax benefits*** to investors.
  FVIF $_{TDA}$ = FVIF $_{taxEx}$ (1 – T_n)

Taxable	Tax Deferred	Tax Exempt
Contributions are taxable	Contributions are tax deductible	Contributions are taxable
Investment returns are taxed	Investment returns grow tax-free	Investment returns grow tax-free
	Funds withdrawn	Funds withdrawn

Taxable	Tax Deferred	Tax Exempt
	are taxed at ordinary rate	are tax-free
	FV = Initial Investment $(1 + r)^n (1 - T_n)$	FV = Initial Investment $(1 + r)^n$

Practice: Example 10, Volume 2, Reading 10.

4.3 After-Tax Asset Allocation

After-tax asset weight of an asset class (%) =
After-tax Market value of asset class ($) / Total after-tax value of Portfolio ($)

Example:

Account Type	Asset Class	Pre-tax Market Value ($)	Pretax Weights (%)	After-tax Market Value ($)	After-tax Weights (%)
TDA	Stock	1,000,000	64.52	800,000	61.54
Tax-Exempt	Bonds	550,000	35.48	500,000	38.46
Total Portfolio		1,550,000	100	1,300,000	100

Challenges to incorporating After-tax allocation in portfolio management:

- **Time horizon:** The after-tax value of investment depends on investor's time horizon which is hard to estimate and is not constant.
- **Educating clients about investment procedures:** The investment advisor needs to make clients comfortable with, aware of, and understand after-tax asset allocation.

4.4 Choosing Among Account Types

Important to Note: *The amount of money invested in a tax-exempt account may NOT necessarily always have after-tax future value > the amount invested in tax deferred account, all else equal.*

Reason: Unlike TDAs, contributions to tax-exempt accounts are NOT tax-deductible. As a result,

After-tax Initial investment in tax-exempt accounts = $(1 - T_0)$

Future value of a pretax dollar invested in a tax-exempt account = $(1 - T_0)(1 + r)^n$

Future value of a pretax dollar invested in a TDA = $(1 + r)^n (1 - T_n)$

- When the prevailing tax rate at the time of fund withdrawals i.e. T_n< (>) tax rate at the time of investment i.e. T_0➔ Future after-tax accumulation of assets held in a TDA will be greater (lower) than that of a tax-exempt account.
- When the prevailing tax rate at the time of fund withdrawals i.e. T_n = tax rate at the time of investment i.e. T_0➔ Future after-tax accumulation of assets held in a TDA will be equal to that of tax-exempt account.

Example:

Suppose, an investor has a marginal tax rate of 40% and is willing to invest $1500. He has two options to do so i.e.

1. **Invest $2,500 pretax in a TDA**(i.e. 1,500 / (1 – 0.40) = $2,500) at 5% return for 5 years ➔It will reduce current year's taxes by $1,000 (i.e. 2,500 – 1,500).

   FV = $2,500 $(1.05)^5$ (1 – 0.40) = $1,914 after taxes

2. **Invest $1,500 after-tax in a tax-exempt account** at 5% return for 5 years.

   FV = $1,500 $(1.05)^5$ = $1,914 ➔ the same as the TDA.

Suppose, the tax rate at the time of withdrawal is 20% which is less than current tax rate of 40%.

FV of tax-exempt account will remain unchanged. However,

FV of TDA = $2,500 $(1.05)^5$ (1 – 0.20)
= $2,552 → greater than FV of tax-exempt account

Practice: Example 11, Volume 2, Reading 11.

5. TAXES AND INVESTMENT RISK

When investments are held in an account subject to annual taxes, a government shares both the part of the investment return and the investment risk i.e.,

Investors after-tax risk = Standard deviation of pre-tax return (1 – Tax rate)
$= \sigma(1 - T)$

Implication: Taxes tend to reduce both investment risk and return.

In contrast, when investments are held in TDAs or tax-exempt accounts, all of the investment risk is born by investors.

6. IMPLICATIONS FOR WEALTH MANAGEMENT

Tax Alpha: Tax alpha refers to the value generated by using investment techniques that manage tax liabilities in an effective manner.

6.1 Asset Location

Asset location refers to ***locating/placing*** investments (different asset classes) in appropriate accounts. Asset location decision depends on various factors including:

- Tax
- Behavioral constraints
- Access to credit facilities
- Age/time horizon
- Investment availability
- Planned holding period

Implications for Investors:

- Assets that are taxed ***heavily/annually*** should be held in TDA and tax exempt accounts (i.e. bonds).
  - o *Note:* Investments in TDAs and tax-exempt accounts are subject to some limitations; e.g., investors are not permitted to hold all of their investments in these types of accounts.
- Assets that are taxed favorably (i.e. at lower rates) and/or tax deferral should be held in taxable accounts (i.e. equities or tax-free municipal bonds).
  - o Note: Generally, disadvantage associated with low yields on tax-free bonds > the advantage

associated with tax savings.

However, if this practice results in over allocation to one asset class that violates the client's desired asset allocation, then that over allocation should be offset by taking a short position (i.e. borrowing) outside the TDA.

For example, suppose the tax rate of bonds is greater than that of equities. In addition, suppose that an investor (say pension fund) invests a greater portion of its portfolio in bonds, resulting in over allocation to bonds. To offset it, the pension fund can borrow (i.e. short bonds) outside its portfolio and invest the proceeds from short sale in equities.

- The exact amount of funds borrowed (short selling) depends on tax rates and the way assets are taxed.
- However, it may be difficult to exploit this arbitrage because:
  - Investors may have restrictions on the amount and form of borrowing.
  - Borrowing costs are greater than the yield on a bond of similar risk.
  - Investors do not prefer to borrow due to behavioral constraints.
  - Liquidity constraints (e.g. marginal requirements or penalties on withdrawal of funds from TDAs and tax-exempt accounts).

Important to Note: When all income is subject to annual taxation and have the same tax rates, asset location would not matter.

Example:

Data is given in the table below. Suppose ***target pretax asset allocation*** is 60% bonds and 40% stocks.

When Borrowing is allowed:

Account type	Asset class	Existing Pretax Market Value ($)	Existing Pretax Allocation (%)	Asset Class	Target Pretax Market Value ($)	Target Pretax Allocation (%)
TDA	Bond	80,000	80	Bond	80,000	80
Taxable	Stock	20,000	20	Stock	40,000	40
				Short Bond	(20,000)*	(20)
Total		100,000	100		100,000	100

*(80,000 – x) / 100,000 = 0.60 ➔ x = 20,000

The overall asset allocation is $60,000 bonds and $40,000 stock which attains the target allocation of 60% bonds and 40% stocks.

When borrowing is NOT allowed:

Account type	Asset class	Existing Pretax Market Value ($)	Existing Pretax Allocation (%)	Asset Class	Target Pretax Market Value ($)	Target Pretax Allocation (%)
TDA	Bond	80,000	80	Bond	60,000	60
				Stocks	20,000	20
Taxable	Stock	20,000	20	Stock	20,000	20
Total		100,000	100		100,000	100

When borrowing is NOT allowed and investor needs a cash reserve of $5000:

Account type	Asset class	Existing Pretax Market Value ($)	Existing Pretax Allocation (%)	Asset Class	Target Pretax Market Value ($)	Target Pretax Allocation (%)
TDA	Bond	80,000	80	Bond Stocks	55,000 20,000	55 20
Taxable	Stock	20,000	20	Stock Cash	20,000 5,000	20 5
Total		100,000	100		100,000	100

6.2 Trading Behavior

The tax burden (as well as optimal asset allocation and asset location) for different asset classes depends on the investment style and trading behavior of investors.

- **Trader:** Trader trades *frequently* and recognizes all portfolio returns in the form of annually taxed short term gains. The trader accumulates the ***least*** amount of wealth, all else equal.
- **Active investor:** An active investor trades *less frequently* and recognizes some of the portfolio returns in the form of favorably taxed long-term gains. The amount of wealth accumulated by an active investor is greater than that of a trader but less than that of a passive investor and tax-exempt investor.
  - Hence, to offset the tax drag of active trading, an active investor needs to generate greater pretax alphas relative to passive investor.
- **Passive investor:** As the name implies, the passive investor does not trade frequently (i.e. passively buys and holds stock) and recognizes most of the portfolio returns in the form of favorably taxed long-term gains. The amount of wealth accumulated by a passive investor is greater than that of a trader and active investor but less than that of a tax-exempt investor.
- **Tax-exempt investor:** The tax-exempt investor is not subject to capital gains tax and buys and holds stocks. The tax-exempt investor accumulates the ***most*** amount of wealth, all else equal.

Investor type	Accrual equivalent return	Accrual equivalent tax rate
Trader	4	1
Active investor	3	2
Passive investor	2	3
Exempt investor	1	4

Ranking: *1 = highest; 4 = lowest*

6.3 Tax Loss Harvesting

The practice of realizing capital losses that offset taxable gains in that tax year, resulting in decrease in the current year's tax liability is referred to as ***tax loss harvesting***. This strategy is most effective to use when tax rates are relatively high.

Tax alpha from tax-loss harvesting (or Tax savings) =Capital gain tax with unrealized losses – Capital gain tax with realized losses

Or

Tax alpha from tax-loss harvesting = Capital loss × Tax rate

Advantages of tax-loss harvesting:

- It reduces the tax liability in that tax year.
- It increases the amount of net-of-tax money available for investment as the tax savings associated with tax loss harvesting can be reinvested.

Disadvantages of tax-loss harvesting:

- The tax-loss harvesting doesn't allow an investor to offset taxes entirely. This strategy only allows an investor to postpone the payment of taxes in the future; because, when a security is sold at a loss and its sales proceeds are reinvested in a similar security, the cost basis of the security is reset to the lower market value and thereby increases the future tax liabilities.

Example: Suppose,

- Beginning value of portfolio = $1,000,000.
- Capital gain = $50,000
- Tax rate on capital gain = 25%
- Realized losses = $15,000

Calculations:

Capital gain tax = 0.25 × $50,000 = $12,500

Capital gain tax when losses are realized = 0.25 × ($50,000 – $15,000) = $8,750

Tax savings or Tax alpha = $12,500 – $8,750 = $3,750

Or

Tax alpha = 0.25 (15,000) = $3,750

Now suppose the securities with an unrealized loss have a current market value of $135,000 and cost basis of $150,000 (unrealized loss of $15,000). There are two options available.

- ***Option A:*** Hold securities with the unrealized loss, or
- ***Option B:*** Sell securities in the current year (say 2010) and replace them with securities offsetting the same return.

Next tax year (2011), the value of securities increases to $220,000 and the securities are sold regardless of which option an investor chooses.

Case 1:

Tax liability if the investor holds the securities until year end 2011:

Capital gain tax = 0.25 ($220,000 – $150,000) = $17,500

Case 2:

Tax liability if the investor recognizes the loss today in 2010, replaces them with securities offsetting the same return, and realizes the capital gain at year end 2011:

Capital gain tax = 0.25 ($220,000 – $135,000) = $21,250.

Total two-year tax liability under both options

	2010 ($)	2011 ($)	Total ($)
Option A	12,500	17,500	30,000
Option B	8,750	21,250	30,000

Now suppose, the investor reinvests the 2010 tax savings associated with tax-loss harvesting. He has the following two options available:

- ***Option A:*** Hold the securities, or
- ***Option B:*** Sell the securities and reinvest the proceeds and the tax savings in similar securities.

In 2011, the securities experience a 78% increase regardless of which option the investor chooses.

Case 1:

If the investor holds the securities:

Pretax Future value of securities in the next year = $135,000 (1.78) = $240,300.

Case 2:

If the investor recognizes the loss and reinvests the proceeds and tax savings in similar securities:

Pretax Future value of securities in the next year = ($135,000 + $3,750) × (1.78) = $246,975.

After-tax value under both options if securities are sold the next year:

The new capital gain tax for Option B at the end of the next year = 0.25 ($246,975–($135,000 + $3,750)
= $27,056.25

	Pretax ($)	Tax ($)	After-Tax
Option A	240,300	22,575	217,725
Option B	246,975	27,056	219,919

Practice: Example 12, 13 & 14, Volume 2, Reading 11.

Highest-in, first-out (HIFO): It is a strategy in which highest cost basis lots are sold first to defer the tax on the low cost basis lots, resulting in decrease in current taxes.

- Like tax-loss harvesting, the total taxes are the same over time, assuming a constant tax rate over time.
- In addition, (like tax-loss harvesting) HIFO facilitates investors to reinvest the tax savings earlier, which creates tax alpha that grows over time.
- The ***cumulative tax alphas*** from tax loss harvesting increase over time. However, the annual tax alpha tends to decrease over time as the deferred gains are eventually realized (i.e. it is greatest in the early years).
- The higher the tax rates on capital gains, the greater the tax advantage associated with tax loss harvesting and HIFO.
- The more volatile the securities, the greater the tax advantage associated with tax loss harvesting and HIFO.

Lowest in, first out or LIFO: It is a strategy in which lowest cost basis lots are sold first. LIFO is used when the current tax rate is temporarily low.

It is important to understand three things:

1) ***Proper investment management strategy is more critical than proper asset location strategy***; in other words, the optimal asset location in TDAs and taxable accounts cannot dominate the negative impact of a poor investment strategy that either results in negative pretax alpha or is highly tax inefficient.
2) ***All trading is NOT necessarily tax inefficient*** i.e. tax-efficient management of securities in taxable accounts requires gains to grow passively but actively realizing losses.

3) It is not always optimal to harvest losses: When gains in future are likely to be taxed at higher rates, then the more appropriate strategy will be to defer harvesting losses in future so that higher tax on capital gains in future can be offset.

6.4 Holding Period Management

According to holding period management, when long-term gains are taxed more lightly/favorably, then investors should prefer longer holding periods.

Pretax return taxed as a short-term gain needed to generate the after-tax return equal to long-term after-tax return = Long-term gain after-tax return / (1 –short-term gains tax rate)

Example:

Suppose, tax rate of short-term gains is 40% and long-term gains is 25%. An investment earned 12% return.

Long-term after-tax return = 12% (1 – 0.25) = 9%
Short-term after-tax return = 12% (1 – 0.40) = 7.2%

Pretax return taxed as a short-term gain needed to generate the after-tax return equal to long-term after-tax return = 9% / (1 – 0.40) = 15%

Practice: Example 15, Volume 2, Reading 11.

6.5 After-Tax Mean-Variance Optimization

For asset allocation, taking tax into consideration is necessary and crucial. An asset's location has a considerable impact on the after-tax risk and return assumptions i.e. after-tax returns on equities located in taxable accounts may not be the same as after-tax returns on equities located in tax-exempt accounts. Hence, the same asset held in different types of accounts represent different after-tax asset.

For example, two asset classes A and B held across two types of accounts (taxable and tax deferred) basically represent four different after-tax assets i.e. asset class A and B in a taxable and asset class A and B in a tax deferred account.

This implies that pretax efficient frontiers may not represent appropriate proxies for after-tax efficient frontiers. Thus, in the minimum variance optimization algorithm, it is more appropriate to use after-tax standard deviations of returns and accrual equivalent returns rather than pretax standard deviations and pretax returns, respectively. Additionally, the optimization process must include some constraints e.g. limits on the amount of funds and types of assets that can be allocated in tax-advantaged accounts.

Practice: End of Chapter Practice Problems For Reading 11 & FinQuiz Item-set ID# 11238 & 12499.