

Federal Income Taxes and Investment Strategy

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CAS Study Note

EXAM 7 STUDY NOTE: FEDERAL INCOME TAXES AND INVESTMENT STRATEGY

This reading explains tax influences on investment strategy for property-casualty insurers.

Learning objectives: Why do property-casualty insurers choose certain asset classes? Why do they prefer bonds over stocks? Why are they a major clientele for municipal bonds? What type of stocks are best for insurers? How should an insurer select the mix of corporate and municipal bonds to optimize net after-tax income?

Federal income taxes affect investment strategy for both taxable and tax-exempt investors: it is as foolish for a university endowment to buy municipal bonds as it is for a high tax bracket investor to ignore them.¹ But tax analysis is more complex than simply applying tax rates to asset classes. If all investors had the same tax rates, the pre-tax returns on assets would adjust so that the after-tax returns were the same, except for differences stemming from quality, maturity, callability, liquidity, or other attributes of the securities.

Illustration: Suppose all investors are taxable at the same rate – 35% for bonds and 20% for common stock – and they require a 5% after-tax premium for stocks over bonds. If the pre-tax yield on bonds is 10%, its after-tax yield is 6.5%, the required return on stocks is 11.5%, and the needed pre-tax return on stocks is $11.5\% / (1 - 20\%) = 14.38\%$. If stocks yielded more than 14.38%, investors would shift from bonds to stocks, bidding up the price of stocks until the expected return declined to 14.38%.²

Tax Rates: Investor Types

Consider a matrix of investor types by asset classes. For simplicity, investors are in four types: personal, corporate, tax exempt entities, and property-casualty insurers, and we consider broad asset classes.

- Most investors (by dollars of investment) have high incomes with marginal tax rates of 32% to 36%.³ Individual investors have a 15% tax rate on long-term capital gains and on stockholder dividends, and \$3,000 of capital losses each year can offset regular taxable income.⁴ Individuals can use variable life insurance and variable annuities, which defer taxes on pension income and eliminate income taxes on death benefits.⁵ IRA's provide tax exempt income, but they are restricted to small annual investments. Many firms provide tax exempt savings vehicles for retirement; these are limited to a percentage of salary and a dollar cap. Mutual funds pass investment income to their owners without an intervening layer of federal income taxes. Their investors' marginal tax rate is the same as for individual investors, but at lower average tax brackets.⁶
- Non-insurance corporations have a 0% tax rate on municipal bond income, a 10.5% rate on stockholder dividends, and a 35% rate on other investment income.⁷
- Charities, endowments, and educational, scientific, and philanthropic foundations, are exempt from federal income taxes.⁸ Life insurers, annuity writers, and pension funds have various tax deferrals and exemptions. Investment earnings on assets backing life insurance policy reserves, annuity reserves, and pension liabilities are not taxed until the policyholder withdraws money from the account value, or the annuity or pension

- funds are paid. Life insurance death benefits are not subject to income tax at all.⁹
- Property-casualty (and life) insurers are subject to a proration provision on tax exempt investment income (municipal bond income and dividends received deduction).¹⁰

We examine tax incentives to hold stocks vs bonds.¹¹ The U.S. bond market is somewhat larger than the U.S. stock market; if foreign securities are included, the stock market is larger. The tax effects provide incentives for personal investors to hold stocks and for insurers (both life and property-casualty) to hold bonds.¹²

We examine the marginal tax rates for property-casualty insurers. The ratio of bonds to stocks for property-casualty insurers is about 3 to 1. Life insurers and commercial banks hold few stocks. Personal investors prefer common stocks to bonds. Defined benefit pension plans hold about equal amounts of stocks and bonds.

- *Bonds*: The marginal tax rate is 5.25% on municipal bonds and 35% on other bonds.¹³ The yield on municipal bonds is about 75% of the yield on comparable corporate bonds, and the after-tax yield is somewhat higher for municipal bonds.¹⁴
- *Stocks*: The marginal tax rate on dividends is 14.175%. The marginal tax rate on capital accumulation, assuming a ten year holding period and a 12% average annual gain, is 25%.¹⁵ Assuming a split of 15% dividends and 85% capital gains, the marginal tax rate on common stocks is $15\% \times 14.175\% + 85\% \times 25\% = 23.38\%$.

The marginal tax rates for high-tax bracket personal investors for bonds and stocks are:

- *Bonds*: The marginal tax rate is zero on municipal bonds and about 32% to 36% on other bonds, depending on the investor's income.¹⁶ We use a 35% tax rate here.
- *Stocks*: The tax rate is 15% on shareholder dividends and long-term capital gains. For a ten year holding period and a 12% average annual gain, the effective tax rate on capital gains is 9.92%.¹⁷ Assuming a split of 15% dividends and 85% capital gains, the marginal tax rate on common stocks is $15\% \times 15\% + 85\% \times 9.92\% = 10.68\%$.

Compared to personal investors, insurers have a higher *relative* tax rate on stocks and a lower *relative* tax rate on bonds. Personal investors invest more in common stocks, and insurers invest more in bonds.¹⁸

The tax incentives must be weighed with other influences on investment strategy:

- *Yield*: Stocks have higher expected yields than bonds. On average, stocks yield about 7% more than Treasury bills or 4% more than investment grade corporate bonds. The higher yield compensates for the uncertainty in common stock returns and the other factors discussed in this paper.
- *Diversification*: It was once more difficult to diversify a bond portfolio than a stock portfolio; now personal investors can diversify bond portfolios with mutual funds.¹⁹
- *Asset liability management*: Life insurers and pension funds use long-term fixed-income securities to match fixed-income insurance and pension obligations. Property-casualty reserves are inflation sensitive; bonds are not always a suitable funding vehicle. Personal investors have few fixed-income liabilities; most seek high yields that provide

some inflation protection.

- *Capital requirements*: The risk-based capital formula creates incentives for life insurers to hold bonds instead of stocks. The incentives for property-casualty insurers to hold either stocks or bonds are not material. (The risk-based capital charge for common stocks is 30% for life insurers and 15% for property-casualty insurers. The average RBC charge for investment grade bonds is about 2% of their value. The difference between common stocks and bonds is $30\% - 2\% = 28\%$ for life insurers and $15\% - 2\% = 13\%$ for property-casualty insurers. Because of the covariance adjustment, the marginal effect of any capital charge is proportional to the size of its risk category: $C_1 + C_3$ vs C_2 for life insurers and R_1 through R_5 for property-casualty insurers. For life insurers, the $C_1 + C_3$ category (asset risks plus interest rate risks) is about 3 or 4 times the size of the C_2 category; the covariance adjustment reduces the asset risk charges by about 3% to 5%. The cost of shifting from bonds to stocks is $28\% \times (1 - 4\%) = 26.88\% \approx 27\%$. For property-casualty insurers, the R_1 and R_2 charges (fixed income and equity securities) are each about one tenth the underwriting risk charges, and the covariance adjustment reduces their effect by 92%. The 13% difference between stocks and bonds has a marginal effect of about 1% on total capital requirements.)
- The *asset adequacy analysis* creates an incentive for life insurers to hold bonds instead of stocks. The *Statement of Actuarial Opinion* for property-casualty insurers deals with liabilities only; there is no examination of assets.
- *Statutory accounting* principles and management dislike for erratic income create incentives for insurers to hold bonds instead of stocks.
- Personal investors have no capital requirements or state regulation. Risk-based capital formulas, asset adequacy analyses, and accounting principles are not relevant.

Non-tax factors provide incentives for personal investors to hold stocks and for life insurers to hold bonds. The effect on property-casualty insurers is weaker.²⁰

MUNICIPAL BONDS

Before the 1986 Tax Reform Act, the corporate tax rate was 0% on municipal bond income and 46% on other interest income. If corporate bonds were yielding 10%, municipal bonds of similar investment grade could attract investors with rates as low as 5.4%.²¹ Individual investors in high tax brackets, who faced marginal tax rates as high as 50% before the Reagan tax reductions of the early 1980's, also had strong demand for municipal bonds.²²

Before 1982, commercial banks bought half the municipal bonds, and property-casualty insurers were the second largest clientele. Life insurers, annuity writers, and pension plans, who have tax deferrals or exemptions, do not buy municipal bonds.²³ Tax law changes in 1982, 1984, and 1986 removed the tax exemption for municipal bonds bought with borrowed funds (i.e., municipal bonds bought by banks). Commercial banks now buy only 1% of municipal bonds.²⁴ Property-casualty insurers are the largest corporate clientele.²⁵

The proration provision makes the effective tax rate for insurers 5.25% on municipal bond income.²⁶ But the relative tax disadvantages for commercial banks, tax exempt investors, and most personal investors (who prefer common stock) are strong, so property-casualty insurers are a major clientele for municipal bonds (45% of their investment portfolios).²⁷

The 5.25% tax rate is absorbed by higher yields on municipal bonds; it is paid by the states, not by insurers.

Taxes and Invested Capital

Insurers' holdings of taxable vs tax exempt securities correspond to the division between policyholder reserves and capital.²⁸ The negative income from the unwinding of the IRS interest discount on loss reserves is offset by the investment income on taxable bonds backing the reserves. Tax exempt bonds match capital that does not offset taxable income.

If insurers had no systematic risk or cost of bankruptcy, and they held fair value reserves and no surplus, the expected pre-tax income during the policy term would be zero, since the fair premium equals the present value of expected losses and expenses. Each year afterward, the amortization of the interest discount in the reserves offsets the investment income, and pre-tax income would again be zero.²⁹

Property-casualty insurers hold capital, explicitly in surplus and implicitly in gross unearned premium reserves and full value loss reserves. The investment income on this capital is not offset by amortization of the interest discount in the loss reserves, and this investment income creates positive taxable income.

Municipal bonds are less than policyholder surplus, since they are not the only tax exempt securities. Insurers diversify their portfolios with common stock, real estate, and venture capital, which have partial tax exemptions. The tax exempt part of the investment portfolio roughly equals capital funds.

A common view is that bonds back reserves and stocks back surplus. The tax perspective is that the taxable portion of bonds and stocks backs reserves and the tax exempt portion backs capital. (Capital = surplus + equity in unearned premium reserve + the implicit interest discount in loss reserves.) The tax perspective optimizes net after-tax income. The *bonds back reserves* view assumes that bonds are a better match for policyholder reserves. Property-casualty reserves are inflation sensitive, and they are not necessarily better matched by bonds than by stocks.

Municipal bonds yield 70% to 80% of the pre-tax yield on corporate bonds of similar quality. From a pure tax analysis, they should yield 65% to 68.60%.³⁰ Several other items affect the relative yields on corporate vs municipal securities:

- *Callability*: Most municipal bonds are callable; few corporate bonds are now callable. When bond yields declined in the 1980's, many corporate bonds were called. Investors demanded higher call premiums, making the call option expensive. When interest rates continued to fall, corporate issuers saw little need to include call provisions. Municipal bonds continue to use call provisions, and their yields reflect this option.³¹
- *Liquidity*: Municipal bonds are less liquid than corporate bonds and much less liquid than Treasuries, perhaps lowering their market values and raising their yields.³²
- *Tax legislation*: In 1986, the proration provision reduced the tax advantage of municipal bond for insurers and the 1982, 1984, and 1986 tax law changes restricted or removed

the tax advantages for banks (though bonds acquired before August 8, 1986, were grand-fathered). Some foreign countries have reduced or eliminated taxes on interest income to avoid the investment dis-incentives they cause. Investors may fear the U.S. may adopt a similar policy, reducing the relative tax advantage of municipal bonds.

EXERCISES

Investment strategy is complex, since we can not easily measure the tax influences on asset yields and investor preferences. Some exam problems follow the format of the exercises in this section. The problem may specify a change in the tax law and ask how it affects asset yields and investors' choices. The exercises in this study note do not present new material. They help you focus on the concepts to prepare for the exam.

Exercise 1.1: Proration and Investment Strategy: Property-casualty insurers buy many municipal bonds, whose yields increased after 1986 to offset the higher effective tax rate for insurers. Suppose the Congress eliminates the proration provision of the 1986 Tax Reform Act, so that insurers have the same effective tax rate on tax exempt income as other firms.

- A. Will insurers' holdings of municipal bonds increase, decrease, or stay the same?
- B. Will municipal bond yields increase, decrease, or stay the same?
- C. Will other investors' holdings of municipal bonds increase, decrease, or stay the same?

Part A: Insurers' effective tax rate for municipal bonds decreases from 5.25% to 0%. For a given pre-tax yield, the after-tax yield increases by $1 / (1 - 5.25\%)$. Insurer's demand for municipal bonds increases, and they buy more municipal bonds.

Part B: If the demand for a good increases, its price rises. When a bond's price rises, its yield declines. Municipal bond yields decrease to offset the lower tax pay by insurers.³³

Part C: The tax rate for other investors has not changed and the municipal bond yield decreases. Their after-tax return decreases and they buy fewer municipal bonds.³⁴

Exercise 1.2: Commercial Banks and Municipal Bonds: Before 1980, banks were the major clientele for municipal bonds. Suppose the Congress revokes the tax law changes that restrict the tax exemption for municipal bonds bought with borrowed funds. Commercial banks now have the same effective tax rate on tax exempt income as other firms.

- A. Will municipal bond yields increase, decrease, or stay the same?
- B. Will insurers' holdings of municipal bonds increase, decrease, or stay the same?

Part A: If banks have a zero effective tax rate on municipal bond income, they will again become the major clientele. States will gear their yields to banks, who are not affected by proration. Municipal bond yields will decrease.

Part B: Insurers' effective tax rate for municipal bonds does not change. The pre-tax yield decreases, so the after-tax yield decreases, and insurers buy fewer municipal bonds.

Banks replace insurers as the major clientele for municipal bonds, and insurers' share falls.

Banks' purchases of municipal bonds fell from 50% in 1970's to less than 1% in the 1990's because of the tax law changes. Bank purchases might increase to 70% or 80% as they rebuild their portfolios. Insurers would have the highest marginal tax rates, and their purchases may fall to zero for several years, as their holdings of municipal bonds declined.

Exercise 1.3: *Taxes, Stocks, and Bonds*: Suppose the Congress changes the tax law three ways:

- It eliminates the dividends received deduction for corporate taxpayers.
 - It eliminates the long-term capital gains rate for personal taxpayers.
 - It eliminates the special 15% tax rate on stockholder dividends for personal taxpayers. The tax rate on dividends and capital gains is now the normal tax rate for other income.
- A. Will common stock yields increase, decrease, or stay the same?
B. Will bonds yields increase, decrease, or stay the same?
C. Will insurers' holdings of bonds (vs stock) increase, decrease, or stay the same?

Solution 1.3: The tax rate on stocks is lower than that on bonds for both personal and corporate taxpayers. If the Congress makes the changes listed above, the tax rates are the same for stocks and bonds.³⁵

Part A: The effective tax rate on stocks increases, so demand for stocks decreases, their price decreases, and their yield increases.

Part B: The *relative* tax rate on bonds compared to stocks decreases, so demand for bonds increases, their price increases, and their yield decreases.

Part C: Personal taxpayers now have a lower *relative* tax rate on stocks (vs bonds) than corporate taxpayers have. Personal investors are the primary clientele for common stock and corporate taxpayers are the primary clientele for bonds.

After the changes listed above, personal and corporate taxpayers have the same relative tax rates for bonds vs stocks. Neither group has a comparative advantage in either security. Personal investors will buy more bonds and insurers will buy more stocks.

Exercise 1.4: *Taxes and Investment Income*: Some foreign countries have low or zero tax rates on investment income to avoid double taxation. Suppose the U.S. Congress eliminates the tax on investment income.

- A. Will common stock yields increase, decrease, or stay the same?
B. Will bonds yields increase, decrease, or stay the same?
C. Will property-casualty insurers' holdings of bonds vs common stock increase, decrease, or stay the same?

Solution 1.4: The current tax rate on stocks is lower than that on bonds for both personal

and corporate taxpayers. If the Congress eliminates the tax on investment income, the tax rates are the same for stocks and bonds (they are both zero).

Part A: The effective tax rate on stocks decreases, so demand for stocks increases, their price increases, and their yield decreases.

Part B: The effective tax rate on bonds decreases, so demand for bonds increases, their price increases, and their yield decreases.

Part C: The study note explains that personal taxpayers now have a lower relative tax rate on stocks (vs bonds) than corporate taxpayers have. Personal investors are the primary clientele for common stock and corporate taxpayers are the primary clientele for bonds.

If the tax on investment income is eliminated, personal and corporate taxpayers have the same relative tax rates for bonds vs stocks. Neither group has a comparative advantage in either security. Personal investors buy more bonds and insurers buy more stocks.

CAPITAL GAINS

Capital gains received by insurers are taxed at 35% when they are realized; taxes are not paid on unrealized capital gains. The value of the tax deferral depends on the turnover rates. If stocks are traded frequently, the tax deferral is worth little. If stocks are held indefinitely, the value of the tax deferral is large.³⁶

A deferral of the tax liability reduces the effective tax rate. For a 12% yield and a 10 year deferral, the effective tax rate is 25%. This is still higher than the tax rate on dividends or the capital gains tax rate for personal taxpayers.

For tax analysis, we compute the effective pre-tax equivalent yield for a given stated yield. The difference between the effective yield and the stated yield varies with the length of the tax deferral, or the holding period of the securities.

We write $E = f(Y, T, L)$, where E = pre-tax equivalent yield, Y = pre-tax stated yield, T = tax rate, L = length of the deferral period. The partial derivative of E with respect to each of the input variables is positive: $\partial E / \partial Y > 0$, $\partial E / \partial T > 0$, and $\partial E / \partial L > 0$.

- *Stated yield (Y):* The higher the stated yield, the higher is the pre-tax equivalent yield.
- *Tax rate (T):* The higher the tax rate, the greater is the gain from tax deferral.
- *Length of deferral:* The longer the deferral, the greater is the gain from deferral.

Illustration – High Turnover: A \$1,000 stock portfolio has expected capital gains of 10% a year and a turnover of 25% a year. To simplify, we assume each stock is held for four years and then sold to realize the capital gains.³⁷ After four years, the stocks are worth $\$1,000 \times 1.100^4 = \$1,464.10$. The pre-tax income is \$464.10, and the after-tax income is $\$464.10 \times (1 - 35\%) = \301.67 . The annual after-tax yield to achieve this income is $(1 + \$301.67 / \$1000)^{1/4} - 1 = 6.81\%$ per annum. The pre-tax equivalent yield is $6.81\% / (1 - 35\%) = 10.48\%$ per annum.

Illustration – Low Turnover: With a turnover of 5% a year, stocks are held for 20 years (on average). At the end of twenty years, they are worth $\$1,000 \times 1.100^{20} = \$6,727.50$. Pre-tax income is $\$5,727.50$, and the after-tax income is $\$5,727.50 \times (1 - 35\%) = \$3,722.88$. The annual after-tax yield to achieve this income is $(1 + \$3,722.88 / \$1000)^{0.05} - 1 = 8.07\%$ per annum. The pre-tax equivalent yield is $8.07\% / (1 - 35\%) = 12.42\%$.

Personal taxpayers have a 15% tax rate on long-term capital gains and dividends. Their effective tax rate is slightly lower on capital gains, because of the tax deferral. The relative tax rates of personal taxpayers and insurers imply that

- Individual investors prefer growth stocks with high returns.
- Insurers prefer income paying stocks to growth stocks.

*Illustration:*³⁸ An insurer can invest \$100 million in bonds yielding 10% per annum or in common stocks that pay no dividends but that will increase in value by 10% per annum. To avoid issues of investment risk, we assume that both investments are risk-free. The stock return is less certain, but the return on these stocks is not correlated with the overall market return, so the systematic risk is zero.

One Year Holding Period: During the first year, the bond interest is \$10 million. The federal income tax liability is \$3.5 million, and the increase in statutory surplus is \$6.5 million. The after-tax investment yield is 6.5% per annum.

During the first year, the change in the stock value is +\$10 million. The deferred tax liability is \$3.5 million, so the change in the statutory balance sheet is a \$6.5 million increase in surplus. For a one-year holding period, the after-tax investment yield is 6.5% for the stocks.

Although the change in surplus is the same for the two investments, the cash flows are not the same. The stock scenario has an extra \$3.5 million in marketable securities, which is offset by a \$3.5 million *non-cash* deferred tax liability.

For a multi-year scenario, the yields on the bonds and the common stocks are not identical. For the two year scenario, we assume the interest income is reinvested in the same bonds.

Two Year Holding Period: The bond portfolio pays interest of \$10 million the first year; \$3.5 million is paid to the U.S. Treasury; and \$6.5 million is reinvested in the bond portfolio. During the second year, the bond portfolio pays interest of $\$106.5 \text{ million} \times 10\% = \10.65 million ; $\$10.65 \text{ million} \times 35\% = \3.7275 million is paid to the U.S. Treasury; and $\$10.65 \text{ million} \times 65\% = \6.9225 million is reinvested in the bond portfolio. The total bonds after two years is $\$106.5 \text{ million} + \$6.9225 = \$113.4225$. This is a 6.5% annual yield, since $1.065^2 = 1.134225$. The pre-tax equivalent yield is $6.5\% / (1 - 35\%) = 10\%$ per annum.

The common stock portfolio appreciates to \$110 million the first year. Nothing is paid to the U.S. Treasury, and the company sets up a \$3.5 million deferred tax liability on its balance sheet. During the second year, the common stock portfolio appreciates to \$121 million. Nothing is yet paid to the U.S. Treasury, and the company increases the deferred tax liability to $\$21 \text{ million} \times 35\% = \7.35 million . The net common stock asset is \$121

million – \$7.35 million = \$113.65 million. This is a 6.607% annual yield, since $1.06607^2 = 1.1365$. The pre-tax equivalent yield is $6.607\% / (1 - 35\%) = 10.16\%$.

The effect of the tax deferral on the effective investment yield is small for a short holding period and greater for longer holding periods. Let y be the pre-tax yield, r be the tax rate, and h be the holding period in years. The pre-tax return after h years is $(1+y)^h - 1$; the after-tax return after h year is $((1+y)^h - 1) \times (1 - r)$; the equivalent after-tax yield is $((1+y)^h - 1) \times (1 - r) + 1)^{1/h} - 1$; and the pre-tax equivalent yield is $((1+y)^h - 1) \times (1 - r) + 1)^{1/h} - 1) / (1-r)$. For example, the pre-tax equivalent yield of a 40 year 8% investment used to fund a pension liability with taxes deferred until maturity is $((1.08)^{40} - 1) \times (1 - 0.35) + 1)^{0.025} - 1) / (1-0.35) = 10.63\%$.

OPERATING INCOME, BOND PORTFOLIO, AND INVESTMENT STRATEGY

After-tax yields are generally higher for tax exempt bonds in the regular tax environment and for taxable bonds in the alternative minimum tax environment. An insurer maximizes its after-tax net income by a bond portfolio that equalizes the regular and alternative minimum income taxes.³⁹

Illustration: In 20X4, an insurer has regular taxable income (RTI) of \$200 million and alternative minimum taxable income (AMTI) of \$350 million. The market softens, and the insurer expects underwriting income to be \$20 million less in 20X5 and 20X6. It buys \$400 million of bonds each year. We optimize the bond buying strategy.⁴⁰

If the insurer makes no changes to its bond portfolio, it expects \$80 million of RTI and \$155 million of AMTI in 20X5. The ratio of \$155 million to \$80 million = 193.75% is not optimal.

By shifting from tax exempt to taxable bonds, RTI increases by more than AMTI. Let y be the yield on corporate bonds and $y \times 75\%$ be the yield on municipal bonds. Shifting Z dollars from taxables to tax exempts increases RTI by $Z \times y \times (1 - 75\% \times 15\%) = 88.75\% \times Z \times y$ and AMTI by $Z \times y \times [1 - 75\% \times (15\% + 85\% \times 75\%)] = 40.9375\% \times Z \times y$.⁴¹

If $y = 7\%$, which is about the yield on investment grade corporate bonds in 2008, we have

$$\begin{aligned} \$155 \text{ million} + Z \times 7\% \times 40.9375\% &= 175\% \times (\$80 \text{ million} + Z \times 7\% \times 88.75\%) \\ \$155 \text{ million} - 175\% \times \$80 \text{ million} &= Z \times [(175\% \times 7\% \times 88.75\%) - (7\% \times 40.9375\%)] \\ Z &= \$187.35 \text{ million.} \end{aligned}$$

The bond buying strategy depends on the bonds that mature during the year. If the insurer holds an even split of municipal and corporate bonds, with the same percentage of each maturing in 20X8, shifting Z dollars from tax exempt to taxable bonds is like buying $2Z$ dollars of taxable bonds. Of the \$400 million, $2 \times \$187.35 \text{ million} = \374.70 million is used for taxable bonds and the remaining $\$400 \text{ million} - \$374.70 \text{ million} = \25.30 million is split evenly between tax exempt and taxable bonds.

This example assumes the insurer expects less underwriting income in future years, as might happen in soft markets with low rates. If income declines from an October hurricane,

the needed shift from tax exempt to taxable bonds for the remaining three or four months is so large that the expenses of selling and buying bonds exceed the tax benefits.

The mix of taxable vs tax exempt bonds is a long-term strategy. If the insurer expects less underwriting profit, it buys taxable securities; if it expects more underwriting profit, it buys tax exempts. The cost of *trading bonds* (transactions costs of the trade and costs of selecting securities) may exceed the tax advantages. To shift toward an asset class, the insurer buys more securities in that asset classes from new premiums.

Exercise 1.5: Bond Portfolio:⁴² In 20X6, an insurer holds \$500 million each of corporate and municipal bonds, with pre-tax yields of 7% and 5%. Its alternative minimum income tax equals its regular income tax.

10% of the bonds mature each year, and the insurer buys \$100 million of new bonds. Assume all bonds mature on December 31, and all bonds are bought on January 1.

On January 1, 20X7, the pre-tax yields on corporate and municipal bonds changes to 8% and 6%. Will the insurer buy more corporate bonds or municipal bonds in 20X7?

Solution 1.5: We show both algebraic and intuitive solutions.

Algebraic solution: If the insurer buys \$50 million each of corporate and municipal bonds, its regular taxable income increases by

- *Corporate bonds:* \$50 million \times (8% – 7%) = \$500,000
- *Municipal bonds:* \$50 million \times (6% – 5%) \times 15% = \$75,000
- *Total:* \$500,000 + \$75,000 = \$575,000

Its alternative minimum taxable income increases by

- *Corporate bonds:* \$50 million \times (8% – 7%) = \$500,000
- *Municipal bonds:* \$50 million \times (6% – 5%) \times [15% + 75% \times 85%] = \$393,750
- *Total:* \$500,000 + \$393,750 = \$893,750

The ratio \$893,750 / \$575,000 = 1.554 is less than 1.750.

To increase the ratio to 1.750, it buys more municipal bonds and fewer corporate bonds.

Intuitive solution: We examine the relative yields of corporate and municipal bonds.

- Before the change, municipals yield 5% / 7% = 71.43% as much as corporate bonds.
- After the change, municipals yield 6% / 8% = 75.00% as much as corporate bonds.

The relative yield of municipal bonds increases, so insurers buy more municipal bonds.

Exercise 1.6: Bond Portfolio: In 20X6, an insurer holds \$500 million each of corporate and municipal bonds, with pre-tax yields of 7% and 5%. It holds no common stock or other tax

exempt investments. Its alternative minimum income tax equals its regular income tax.

10% of the bonds mature each year, and the insurer buys \$100 million of new bonds. Assume all bonds mature on December 31, and all bonds are bought on January 1.

On January 1, 20X7, the pre-tax yields on corporate and municipal bonds changes to 8% and 6%. The insurer's other income (besides its bond income) remains the same.

- A. What is the insurer's regular taxable income (RTI) and alternative minimum taxable income (AMTI) in 20X6?
- B. Of the \$100 new bonds purchased in 20X7, what percentage are municipal bonds?

Part A: The insurer's bond income in 20X6 is

- *RTI:* \$500 million \times 7% + \$500 million \times 5% \times 15% = \$38.75 million.
- *AMTI:* \$500 million \times 7% + \$500 million \times 5% \times [15% + 75% \times 85%] = \$54.6875 million.

If the insurer's other income is Z, and AMTI = 175% \times RTI, then

$$\begin{aligned} \$54.8675 \text{ million} + Z &= 175\% \times (\$38.75 \text{ million} + Z) \\ \Rightarrow 0.75Z &= \$54.8675 \text{ million} - 1.75 \times \$38.75 \text{ million} = (\$12.9450) \text{ million} \\ \Rightarrow Z &= -\$12.945 \text{ million} / 0.75 = -\$17.2600 \text{ million} \end{aligned}$$

The insurer has underwriting income of $-\$17.26$ million. For many insurers, underwriting income is negative, and it is offset by positive investment income.

In 20X6, RTI is \$38.75 million $-$ \$17.26 million = \$21.49 million, and AMTI is \$54.8675 million $-$ \$17.26 million = \$37.6075 million. We verify that 1.75 \times \$21.49 million = \$37.6075 million.

Part B: In 20X7, \$50 million each of corporate and municipal bonds mature.

- RTI declines by \$50 million \times 7% + \$50 million \times 5% \times 15% = \$3.875 million.
- AMTI declines by \$50M \times 7% + \$50M \times 5% \times (15% + 75% \times 85%) = \$5.46875M.

On 1/1/20X7, the insurer buys Z of municipal bonds and (\$100 M $-$ Z) of corporate bonds.

- RTI increases by (\$100 million $-$ Z) \times 8% + Z \times 6% \times 15% = \$8 million $-$ \$0.0710Z.
- AMTI increases by (\$100 million $-$ Z) \times 8% + Z \times 6% \times (15% + 75% \times 85%) = \$8 million $-$ \$0.03275Z.

We set AMTI = 175% \times RTI and we solve for Z.

$$\begin{aligned} \$8 \text{ million} - \$0.03275Z - \$5.46875 \text{ million} &= \\ 1.75 \times (\$8 \text{ million} - \$0.071Z - \$3.875 \text{ million}) & \\ \Rightarrow 1.75 \times \$0.071Z - \$0.03275Z &= \\ 1.75 \times (\$8 \text{ million} - \$3.875 \text{ million}) - (\$8 \text{ million} - \$5.46875 \text{ million}) & \end{aligned}$$

$$\Rightarrow \$0.09150Z = \$4.68750 \text{ million}$$
$$\Rightarrow Z = 4.68750 \text{ million} / 0.09150 = \$51.22951 \text{ million}$$

The previous exercise says the insurer shifts toward municipal bonds. This exercise says it buys \$51.23 million of municipal bonds to replace the \$50 million which mature.

* * * * *

Conclusion: Taxes affect investment strategy because marginal tax rates differ by investor and asset class. This module illustrates the tax analysis for property-casualty insurers, emphasizing bonds vs stocks and the types of securities within each class. Other items influence investment strategy as well. Tax analysis is a starting point, not the ending point.

APPENDIX: GROWTH VS INCOME STOCKS

[Note to students: Investment strategy for growth vs income stocks is debated. This appendix extends the tax principles in this study note to stock analysis. The appendix is not on the Exam 7 syllabus. It is useful if you deal with investment strategy in your company work, but it is not needed for exam preparation.]

We compare the marginal tax rates on growth stocks (with no dividends) vs income stocks (with regular dividends) for personal investors, insurers, and other firms.

Illustration: Suppose growth stocks with no dividends grow 12% per annum and income stocks pay 8% dividends and grow 4% per annum. We consider two turnover rates: 10% per annum (10 year holding period) and 20% per annum (5 year holding period).

Personal investors pay a 15% tax rate on dividends and realized capital gains. The 8% pre-tax dividend yield is an $8\% \times 85\% = 6.80\%$ after-tax yield. The after-tax yield from capital accumulation of 12% or 4% in a 5 year or 10 year horizon is

- 12% with 5 year holding period: $((1.12^5 - 1) \times 0.85 + 1)^{0.2} - 1 = 10.507\%$
- 12% with 10 year holding period: $((1.12^{10} - 1) \times 0.85 + 1)^{0.1} - 1 = 10.805\%$
- 4% with 5 year holding period: $((1.04^5 - 1) \times 0.85 + 1)^{0.2} - 1 = 3.438\%$
- 4% with 10 year holding period: $((1.04^{10} - 1) \times 0.85 + 1)^{0.1} - 1 = 3.482\%$

Corporate investors have a 35% marginal tax rate on capital gains; the after-tax yields are

- 12% with 5 year holding period: $((1.12^5 - 1) \times 0.65 + 1)^{0.2} - 1 = 8.382\%$
- 12% with 10 year holding period: $((1.12^{10} - 1) \times 0.65 + 1)^{0.1} - 1 = 9.007\%$
- 4% with 5 year holding period: $((1.04^5 - 1) \times 0.65 + 1)^{0.2} - 1 = 2.670\%$
- 4% with 10 year holding period: $((1.04^{10} - 1) \times 0.65 + 1)^{0.1} - 1 = 2.754\%$

The marginal tax rate on stockholder dividends is 10.50% for non-insurance companies and 14.175% for insurers. The 8% pre-tax yield is an $8\% \times 89.5\% = 7.160\%$ for non-insurance companies and $8\% \times 85.825\% = 6.866\%$ for insurers. The combined yields are

	Five year holding period			Ten year holding period		
	Personal	Insurer	Corporate	Personal	Insurer	Corporate
Growth	10.51%	8.38%	8.38%	10.81%	9.01%	9.01%
Income	10.24%	9.54%	9.83%	10.28%	9.62%	9.91%
Difference	-0.27%	1.15%	1.45%	-0.52%	0.61%	0.91%

Illustration: Consider income stocks with a ten year holding period. The returns are 3.482% + 6.80% = 10.28% to personal taxpayers; 2.754% + 6.866% = 9.62% to property-casualty insurance companies; and 2.754% + 7.160% = 9.91% to other corporate taxpayers.

A personal investor slightly prefers growth stocks, with after-tax yields 25 to 50 basis points

higher than those of income stocks. Corporate investors prefer income stocks, whose after-tax yield is 60 to 115 basis points higher for insurers and 90 to 145 basis points higher for other firms. Investing in stock indices with no regard for taxes is not optimal.

¹ Some analysts assume that tax exempt investors need not consider taxes; they simply avoid tax shelters and other tax advantaged instruments. This is mistaken. For example, taxable investors face lower rates on stocks than on bonds, so tax exempt investors have a comparative advantage in bonds. If taxable investors face different tax rates by type of investment, the reaction of the capital markets to the taxable investors influences the investment strategy of the tax exempt investors as well.

² Similarly, if stocks yielded less than 14.38%, investors would shift from stocks to bonds, bidding down the price of stocks until the expected return rose to 14.38%.

³ Many individual investors can not deduct investment expenses from their tax returns, which raises their effective tax rates. Roy Schrieber, CPA, summarizes the tax rules as follows (personal letter): Investment income for personal taxpayers is taxed on actual income (Schedule B); investment expenses are deductible on Schedule A (Itemized deductions). The income is fully taxable in calculating *adjusted gross income* (AGI); the deductions are a reduction from AGI in arriving at *taxable income*. The investment deductions are limited (based on the taxpayer's AGI), whereas the income is fully taxable. But the expenses cannot be directly deducted from the related income. The deductibility of the expenses depends on other aspects of the taxpayer's return. A taxpayer who cannot itemize is fully taxable on income but gets no deduction for the expenses. If the taxpayer can itemize, only the investment expenses that exceed 2% of the AGI are deductible, which often leads to no deduction whatsoever for high income taxpayers. Some states, such as Massachusetts, have no itemized deductions, so the interest income is fully taxable and there is no expense offset. Other states, like Rhode Island, calculate tax based on the Federal income, so there is a proportionate reduction for the expenses. Still other states, like California, have itemized deductions, just like the Federal return, so the investment expenses are deductible with most of the same caveats as for the Federal return.

⁴ The 15% marginal tax rate for personal investors on stockholder dividends is higher than the rate for non-insurance firms and about the same as for insurers; see the discussion below.

⁵ These investments lose the 15% tax rate on long-term capital gains. They are useful only for long holding periods.

⁶ The highest income individual investors may have their portfolios are managed separately by professional advisors. Mutual funds appeal to middle class investors.

⁷ Firms have mirror image taxation on interest paid and received. A firm that borrows at $k\%$ per annum and invests at $k\%$ has no tax gain or loss, though other friction costs (investment expenses, floatation costs, and default costs) cause a slight loss. Individuals do not have this advantage, since interest payments on most consumer debt is not tax deductible.

⁸ To maintain the tax exempt status, the organization must spend at least 5% of its assets each year on educational, scientific, or philanthropic activities.

⁹ Policyholder dividends paid by mutual life insurers are partially subject to federal taxes (equity tax) before the policyholder's personal tax liability; mutual property-casualty companies do not have this tax.

¹⁰ Corporate and high income personal taxpayers are subject to alternative minimum income tax, reducing the tax advantage of municipal bonds and the dividends received deduction.

¹¹ For simplicity, we consider common stocks vs bonds, where bonds include mortgage-backed securities and collateralized mortgage obligations. We ignore real estate, venture capital, and mortgages, since these asset classes are relatively small for most property-casualty insurers. Real estate is about 1% of financial assets, mortgage loans are about a quarter of one percent, and *all other assets* on the statutory balance sheet are about 4% of financial assets.

¹³ The 5.25% effective tax rate is $15\% \times 35\%$. The proration provision in the 1986 Tax Reform Act deducts 15% of tax exempt income from the loss reserve offset to taxable income.

¹⁴ If the yield on municipal bonds is $(1 - 35\%) / (1 - 5.25\%) = 68.60\%$ of the yield on corporate bonds, the after tax yield is the same. Municipal bonds are often callable, which increases their stated yield. Their lower liquidity and uncertainty about future federal tax law may further increase their yields.

¹⁵ By the dividends received deduction, 70% of dividends are tax exempt. Proration reduces this to $70\% - 15\% \times 70\% = 59.50\%$. The effective tax rate is $(1 - 59.5\%) \times 35\% = 14.175\%$.

In ten years, one dollar accumulates to \$3.106 at a 12% annual rate. When the stock is sold, the tax is $35\% \times (\$3.106 - \$1) = \$0.737$, leaving $\$3.106 - \$0.737 = \$2.369$ after-tax. The yield to achieve this gain is $\$2.369^{0.1} - 1 = 9.0\%$. This is a 25% tax rate on the pre-tax yield of 12%.

¹⁶ A more complete analysis would include state income taxes. Municipal bonds are generally exempt from their domestic state's income tax, but subject to tax by other states.

¹⁷ In ten years, one dollar accumulates to \$3.106 at a 12% annual rate. The after-tax gain upon realization is $85\% \times (\$3.106 - \$1) = \$1.79$. The after-tax investment yield needed to achieve this gain is $(\$1.79 + \$1)^{0.1} - 1 = 10.81\%$, for an effective tax rate of $1 - 10.81\% / 12\% = 9.92\%$.

¹⁸ To be exact, we should include state income taxes and investment expenses. Tax analysis is like comparative advantage in economics. If all investors had the same marginal tax rates, pre-tax yields on securities would adjust so their after-tax yields offset other investment differences, such as systematic risk, expenses, and liquidity. Tax analysis focuses on relative tax rates, not absolute tax rates.

¹⁹ Diversification is a powerful influence on investment strategy. Many personal taxpayers use balanced funds in their pension accounts or IRA's, for which taxable bonds give higher after-tax yields than municipal bonds. Some wealthy personal taxpayers, whose savings exceed the pension deductions they can claim, invest in equities and municipal bonds on their own.

²⁰ We can not easily distinguish the tax vs non-tax influences, except by changes in the tax law. The tax law changes for banks in the early to mid 1980's were so strong that we could easily see the effects. The effects on property-casualty insurers have been milder, and they are obscured by simultaneous changes on different investors.

²¹ Other items affecting relative yields on municipal bonds are call provisions, exceptions from domestic state income taxes, and uncertainties about federal tax law.

²² In 1981, prior to Reagan's tax cuts, the highest tax rate on investment income was 70% (on taxable income over \$215,400 for married filing jointly); the lowest rate was 14%. In 1982, the highest tax rate was 50% on income in excess of \$169,020; the lowest rate was 11%. Personal taxpayers who wish balanced portfolios (both stock and bonds) often put bonds in their pension (tax deferred) accounts and equities in their non-pension accounts. Before 1981, the allowable pension accounts were more restricted, and high income personal taxpayers were more likely to choose municipal bonds for their personal accounts.

²³ Bonds are not commonly held by manufacturers, since they serve no business purpose. For insurers, bonds back policyholder reserves. Firms that hold bonds incur double taxation; their shareholders are better with dividends or share repurchases. Companies in cyclical industries, such as auto manufacturing and airlines, sometimes hold large cash reserves.

²⁴ Commercial bank held 50% of municipal bonds in the 1970's but only 1% by the end of the 1990's. Tax law changes in 1982, 1984, and 1986 severely restricted the tax deductibility of coupon payments on municipal bond bought with borrowed funds.

- The Tax Equity and Fiscal Responsibility Act (TEFRA) in 1982 allowed deductions for only 85% of the interest income on municipal bonds bought with borrowed funds.
- The Deficit Reduction Act of 1984 reduced the percentage to 80%.
- The Tax Reform Act of 1986 eliminated the deduction for large and medium-size municipal bonds.

If the municipality issues general-purpose obligations of less than \$10 million a year, banks can still deduct 80% of the interest income. These municipal bonds, often called bank-qualified bonds, have slightly lower yields reflecting the higher demand, but they are too small to affect the overall bond market. The Tax Reform Act of 1986 has the same grand-fathering clause for banks as the proration provision for insurers: bonds bought before August 8, 1986, retain their 80% tax deductibility.

²⁵ The reductions in the long-term capital gains and stockholder dividend tax rates for personal taxpayers to 15% (by 2004) and the reduction of the highest tax bracket on interest income from 39.6% to 36% have lessened the attraction of municipal bonds for personal taxpayers. Most investment advisors recommend common stocks for the taxable portion of one portfolio and corporate bonds for the tax exempt portion (such as pension funds).

²⁶ Proration applies to life insurers as well. For bonds backing policy reserves, the tax deferral makes municipal bonds inefficient investments. For example, suppose corporate bonds yield 10% per annum and equivalent grade municipal bonds yield 6.5% per annum. With no tax deferral and a tax rate of 35%, the two investments provide the same after-tax return. With a ten year tax deferral, the municipal bond still yields 6.5% after-tax. The corporate bonds yield $(1 + (1.1^{10} - 1) \times 65\%)^{0.1} - 1 = 7.37\%$ after-tax. The advantage of the tax deferral increases as the deferment lengthens.

Capital is a lower percentage of assets for life insurers than for property-casualty insurers, for three reasons:

- The ratio of statutory surplus to assets is low.
- Policy reserves use present values, so the implicit interest discount in the reserves is small.
- Life insurers do not hold unearned premium reserves.

Life insurers can not hold stocks and other equities to back policy reserves, since the asset adequacy analysis requires fixed-income securities. To diversify their investment portfolios, life insurers back capital with equities and other securities besides bonds.

²⁷ Municipal bonds have yields about 75% of those on corporate bonds, which is enough to attract property-casualty insurers and other corporate investors. For tax exempt investors and commercial banks, the after-tax yield on municipal bonds is only 75% of that on corporate bonds.

The Congress passed the proration provision to exact greater tax revenue from property-casualty insurers, and it removed the tax exemption for bonds bought with borrowed funds to increase taxes from banks. The rationale was to prevent wealthy persons (owners of banks and insurers) from benefitting from municipal bond tax deductions. The effect was the opposite:

- Banks' use of municipal bonds raises the interest rate on savings accounts for consumers too small to invest directly in municipal bonds. Banks are financial intermediaries who pass along the tax savings to small depositors. The Congress disallowed this, so only large investors buy municipal bonds.
- The proration provision forces states to raise the pre-tax interest rates on their bonds, whose cost falls on state taxpayers or the beneficiaries of state spending. State sales and income taxes are less progressive than federal income taxes, and much state spending is for the poor (public schools and public transportation). The proration provision shifts money from the states to the federal government, forcing states to raise taxes or reduce spending.

²⁸ Vaughn [1998] similarly differentiates taxable investment income offsetting underwriting losses and tax exempt investment income for the rest of the investment portfolio.

²⁹ In practice, differences between tax basis and present value of liabilities creates minor taxable income.

³⁰ The marginal tax rates for *insurers* are 35% on corporate bonds and 5.25% on municipal bonds. Municipal bonds should yield $(1 - 35\%) / (1 - 5.25\%) = 68.60\%$ as much as corporate bonds.

³¹ To price the options embedded in municipal bonds we must know the interest rate volatility. But the current low U.S. interest rates during prosperous years are unusual. Low interest rates are more common during recessions, such as the U.S. in the 1930's and Japan from the mid-1990's to the mid-2000's. Murphy [1998] estimates that the call option on municipal bonds leads to about a 48 basis point increase in yield.

³² There is no accepted model for pricing liquidity; it is hard to know if it has much effect on yields. Most buyers of municipal bonds intend to hold them to maturity and do not need extra liquidity.

³³ Insurers buy more municipal bonds even though their yields decrease because their after-tax yields increase.

³⁴ The exercise does not ask for the amount of the change. The decrease in the yield and the changes in investors' holdings depend on several items:

- The price elasticity of demand by insurers and other investors for municipal bonds
- The price elasticity of supply of municipal bonds
- The percentage of municipal bonds bought by insurers vs other investors

³⁵ The effective tax rate is still somewhat lower for common stocks because capital gains are not taxed until they are realized.

³⁶ The turnover rate in the stock portfolio is the reciprocal of the average time that the stocks are held. If the annual turnover rate in the stock portfolio is $1/n$, the average stock is held for n years before being sold.

³⁷ A more rigorous analysis would consider the distribution of stock holding periods. A 25% common stock turnover rate might be modeled as 25% of stocks have 1 year holding period; $(1 - 25\%) \times 25\% = 18.75\%$ have a 2 year holding period; $(1 - 25\%)^2 \times 25\% = 14.06\%$ have a 3 year holding period; and so forth.

³⁸ Tax deferral lower the effective tax rate. The exam problem may give a capital gains yield, a holding period, and a statutory tax rate, and ask you for the effective tax rate or the pre-tax equivalent yield. This illustration reviews the mathematics.

³⁹ Optimal tax strategy should not match regular and alternative minimum income tax *exactly*, since losses are stochastic, income is uncertain, and the tax liability is not symmetric. If operating income is volatile, a ratio greater than 1.75 is optimal.

- The tax liability is the regular income tax, bounded from below by the alternative minimum income tax.
- If the alternative minimum income tax exceeds the regular income tax, the difference is deposited with the IRS as the minimum tax credit, which has no expiration. The insurer loses the investment income on these funds; it does not lose the funds itself.

Optimal tax strategy is to keep a small minimum tax credit of about 2% to 10% of the tax liability, depending on the uncertainty of losses. The mix of taxable and tax exempt bonds depends on long-term expectations. Unless the insurer expects large income changes, it lets its minimum tax credit vary and does not try to fine tune its bond portfolio. The insurer may select the optimal minimum tax credit by Monte Carlo simulations from its underwriting and investment portfolios.

Insurers have various tax strategies besides optimizing bond portfolios, such as changing their loss reserve margins and realizing capital gains. These strategies are useful in some scenarios, but they do not replace an optimal bond portfolio.

⁴⁰ We speak of this as *shifting* the bond portfolio. *Selling* bonds incurs extra costs. We shift a bond portfolio by selecting the bonds to *buy* over the coming year.

⁴¹ The 75% ratio of the pre-tax yield on municipal vs corporate bonds varies from year to year. The actuary should use the current ratio for actual tax strategy.

⁴² The CAS Exam may test the ratio of taxable to tax exempt bonds to maximize net after-tax income. The mathematical part of the exam problem deals with long-term investment strategy. The exam problem may also ask about the types of changes (short term vs long-term) that warrant a change in the bond portfolio.