ANSWERS TO STUDY QUESTIONS

Chapter 21

21.1. Bob was trying to meet the target expected return for the portfolio while minimizing its volatility, and he was constrained to use only long (positive) positions in the three asset classes (use no debt or borrowed money to increase leverage).

21.3. MPT prescribes a specific mix of investments across the available alternatives that will be non-dominated, that is, will maximize the expected return for any given risk target in terms of volatility (and/or equivalently minimize the volatility exposure for any given expected return target), and it tells you what is the expected return and risk (volatility) of any such so-called "efficient" portfolio. All of the above based on given expectations about the expected returns, volatilities, and correlations among the available investments.

21.5. This would be the inflation protection role just noted.

21.7. a. The optimal share in real estate remains around one-third of the aggregate 3-asset-class portfolio across a broad spectrum of target returns from very low (conservative) through moderate or average range target returns, then diminishes as one reaches very aggressive targets that involve risk and return levels only achievable in the equities asset class.

b. The inclusion of REITs in the real estate asset class suggests that both direct private as well as indirect public (REITs) real estate have a major role in the optimal portfolio, particularly for moderate target returns reflecting average or mid-level risk preferences. For more conservative targets the role of REITs is less and that of private real estate greater. For more aggressive portfolios the role of REITs is larger than that of private real estate, though ultimately it gives way to equities and small-cap stocks for extremely aggressive investors.

21.9. The two-fund theorem can be useful to represent the role of (essentially) riskless borrowing (levering up the portfolio) and lending (cash holdings), and it provides a single "optimal" mixture of pure risky assets that can be used as a sort of benchmark portfolio of such assets. This optimal all-risky portfolio will generally avoid extreme allocations that can sometimes result for extreme target returns on the all-risky efficient frontier. The Sharpe-maximizing portfolio is the optimal all-risky asset portfolio in the Two Fund Theorem model.

21.11.

	Portfolio	Returns (%)		
		Mean	Standard Deviation	cv
a.	60% stocks / 40% bonds	8.40	10.42	1.240
b.	55% stocks / 35% bonds /10% real estate	8.30	9.74	1.173

The addition of real estate reduces the mean portfolio return by 10 basis points but lowers the volatility of portfolio returns by nearly 50 basis points. Therefore, on a risk-adjusted basis, real estate increases portfolio performance. One way to show this is by calculating the coefficient of variation (cv) in each case, where cv is defined as risk per unit of return equal to standard deviation divided by mean return. The addition of real estate decreases the cv from 1.24 to 1.17, indicating higher risk-adjusted returns with real estate included in the mixed asset portfolio.

21.13. $(0.5)10\% + (0.5)9\% = 9.5\%$