NONMARKETABLE ASSETS

Up to now we have assumed that all assets are readily marketable so that each investor was free to adjust his or her portfolio to an optimum. In truth, every investor has nonmarketable assets or assets that he or she will not consider marketing. Human capital is an example of a nonmarketable asset. People are forbidden by law from selling themselves into slavery in the United States. There is no direct way that an investor can market his or her claims to future labor income. Similarly, the investor has other future monetary claims such as social security payments or the future payments from a private retirement program that cannot be marketed. There are categories of marketable assets that, although the investor might be able to market them, he or she considers them a fixed part of the portfolio. For example, investors who own their own home can market it, but they will often not consider switching houses as part of changes in their "optimum investment portfolio." This is due, in part, to large transaction costs but also because of nonmonetary factors.

If we divide the world up into marketable and nonmarketable assets, then a simple equation exists for the equilibrium return on all assets. Let

R_H equal the one period rate of return on nonmarketable assets

P_H equal the total value of all nonmarketable assets

P_M equal the total value of all marketable assets

All other terms are defined as before. Then, it can be shown that[16]

$$E(R_j) = R_F + \frac{E(R_M) - R_F}{\sigma_M^2 + P_H/P_M \operatorname{cov}(R_M R_H)} \left[\operatorname{cov}(R_j R_M) + \frac{P_H}{P_M} \operatorname{cov}(R_j R_H) \right]$$

To contrast this with the simple capital asset pricing model we can write the simple model as

$$E(R_j) = R_F + \frac{E(R_M) - R_F}{\sigma_M^2} [\operatorname{cov}(R_j R_M)]$$

Notice that the inclusion of nonmarketable assets leads to a general equilibrium relationship of the same form as the simple model that excluded nonmarketable assets. However, the market trade-off between return and risk is different, as is the measure of risk for any asset. Including nonmarketable assets, the market risk-return trade-off becomes

$$\frac{E(R_M) - R_F}{\sigma_M^2 + \dfrac{P_H}{P_M} \operatorname{cov}(R_M R_H)}$$

rather than

$$\frac{E(R_M) - R_F}{\sigma_M^2}$$

It seems reasonable to assume that the return on the total of nonmarketable assets is positively correlated with the return on the market, which would suggest that the market return-risk trade-off is lower than that suggested by the simple form of the model. How much lower is a function of both the covariance between the return on the nonmarketable assets and the marketable assets and the total value of nonmarketable assets relative to marketable assets. If nonmarketable assets had a very small value relative to marketable assets or if there was an extremely low correlation between the return on marketable and nonmarketable assets, there would be little harm done in using the standard CAPM. However, it seems likely that, since nonmarketable assets include at a minimum human capital and since wage rates as well as market performance are correlated with the performance of the economy, there will be important differences between these models.

In addition, the definition of the risk of any asset has been changed. With nonmarketable assets it is a function of the covariance of an asset with the total stock of nonmarketable assets, as well as with the total stock of marketable assets. The weight this additional term receives in determining risk depends on the total size of nonmarketable assets relative to marketable assets. The risk on any asset that is positively correlated with the total of nonmarketable assets will be higher than the risk implied by the simple form of the CAPM.

Considering the difference in both the reward-risk ratio and the size of risk itself, we can see that the equilibrium return for an asset can be either higher or lower than it is under the standard form of the CAPM. If the asset is negatively correlated with the total of nonmarketable assets, its equilibrium return will be lower for its risk and the price of risk will be lower. However, if its return is positively correlated with the return on marketable assets, its equilibrium return could be higher or lower, depending on whether the increased risk is high enough to offset the decreased market price of risk.

Mayers [81] explores the implications of his model for the optimal portfolio holdings of individuals. As you would suspect, investors tilt their portfolio, holding a smaller percentage of those stocks (than found in the market) with which their nonmarketable securities are most highly correlated.

Brito [12, 13] has examined, in more detail, the optimum portfolio holdings of individuals in equilibrium when nonmarketable assets are present. He finds that each individual can select an optimal portfolio from among three mutual funds. The first mutual fund is a portfolio that has a covariance with each marketable asset equal in magnitude but opposite in sign to the covariance between the investor's nonmarketable portfolio and each marketable asset. Note two things about this fund: First, it will have a different composition for different investors, according to the nonmarketable assets they hold. Second, the reason for its optimality has an intuitive explanation. It is that portfolio that diversifies away as much of the nonmarketable risk as it is possible to diversify away. In short, it allows the investor to "market" as much of his or her nonmarketable assets as is possible. Brito then shows that each individual will allocate the remainder of his or her wealth between the riskless security (the second fund) and a third fund that is the market portfolio minus the *aggregate* of all investments made in the first type of fund by all investors. Note that, while the second and third funds are the same for all investors, the first fund has a different composition for each investor, according to the composition of his or her nonmarketable assets.

While Mayers's analysis is important for the insight it provides into the pricing of nonmarketable assets, it is at least as important for the insight it gives us into the missing asset problem. Empirical tests of general equilibrium models will always have to be conducted with the market defined as including something less than the full set of assets in the economy. The equilibrium equations described previously are perfectly valid for examining the missing asset problem, where R_M is now defined as the return on the collection of assets selected to represent the market and R_H is the return on the assets that were left out. In a manner exactly parallel to that presented, they allow us to think through the influence of missing assets on both the markets risk-return tradeoff and the equilibrium return from missing assets.