ECON 345
TOBIN MODEL

6.4 Portfolio Approach to Precautionary Demand

THE principal objection to the Baumol–Tobin transactions model is that it is conducted in a certain world in which bond holding is not risky. This section overcomes the objection by introducing risky bonds which gives an opportunity locus which trades off risk and return. The precautionary model under the portfolio balance approach is the one which is most familiar since it is often used to justify the existence of a diversified portfolio. Diversified portfolios as we have already seen are less risky because risky investments can be offsetting if their returns are negatively correlated. It is unsurprising to find that many investors who aim to avoid the economic costs of uncertainty will tend to manage their portfolios in a precautionary fashion and hence diversify their assets. Organizations such as pension funds

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which put a large weight on achieving a stable and dependable income stream from their investments will diversify extensively.

The basic premiss of the precautionary model, that a higher rate of return is a compensation for taking on a greater level of risk, goes back a long way, certainly to Hicks (1935) and probably earlier if we consider insurance principles. Tobin (1958) used this observation to explain diversification on the grounds that the investor gains utility from a higher rate of return but loses utility from taking on risk and that a trade-off between risk and return can be achieved by diversification between the two assets, bonds and money. By investing in a greater proportion of bonds the investor gains more return and more risk; by holding more money the investor loses interest income but gains by reducing risk. Implicitly we consider the typical investor to be risk-averse, but we do not require this to be so, and can relax the assumption later.

Tobin (1958) considered the expected return to the portfolio, as under the transactions approach but with the possibility of riskiness associated with capital gains or losses. Financial wealth is held in either money or bonds as before and both the risk and the return on money are equal to zero. Any expected return from the portfolio comes from bond holdings. The expected return is equal to the average interest rate plus the average gain or loss times the average bond holding over the period, but since the average gain or loss is equal to zero (by assumption) the expected return is solely a function of interest income:

$$E(R_t) = [E(r_t) + E(g_t)]\,\bar{B}_t, \tag{6.14}$$

where $E(r_t) = \mu$ and $E(g_t) = 0$. The variance of the return is determined by the variance of the gain/loss. Since the gain/loss is $V(g_t)$ the variance of the return to the portfolio can be calculated as

$$V(R_t) = V(g_t)\,\bar{B}_t. \tag{6.15}$$

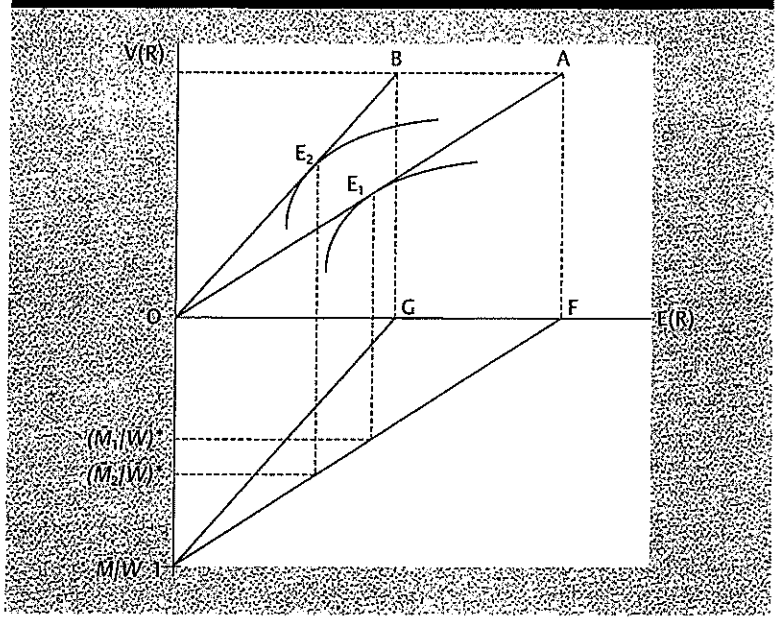
From this we can see that there is a positive relationship between the risk and return to the portfolio, since we can rearrange the equation above and substitute it into the equation for the expected return to the portfolio to give

$$E(R_t) = r_t V(R_t)/V(g_t). \tag{6.16}$$

Both the rate of return and the variance of the gain/loss are positive, hence there is a positive relationship between the rate of return and the risk of the portfolio, which gives an upward-sloping opportunity locus, drawn in Figure 6.4 and labelled *OA*.

We can now use Figure 6.4 in conjunction with indifference curves (indicating preferences of investors) to determine the preferred portfolio mix. If the investor is to maximize the return to the portfolio, then the portfolio must consist of all bonds and the maximum risk at point *A*. If no bonds are held so as to avoid risk altogether, then there will be a zero return to the portfolio on average represented by point *O*. If the investor is risk-averse and gains utility from a higher return and lower risk, then the preference will be to trade off risk and return in a diversified portfolio (point E_1) and we can trace the proportion of average money balances to average wealth, lying between zero and one, in the lower half of the diagram.

Figure 6.4 A change in the rate of interest in a precautionary model

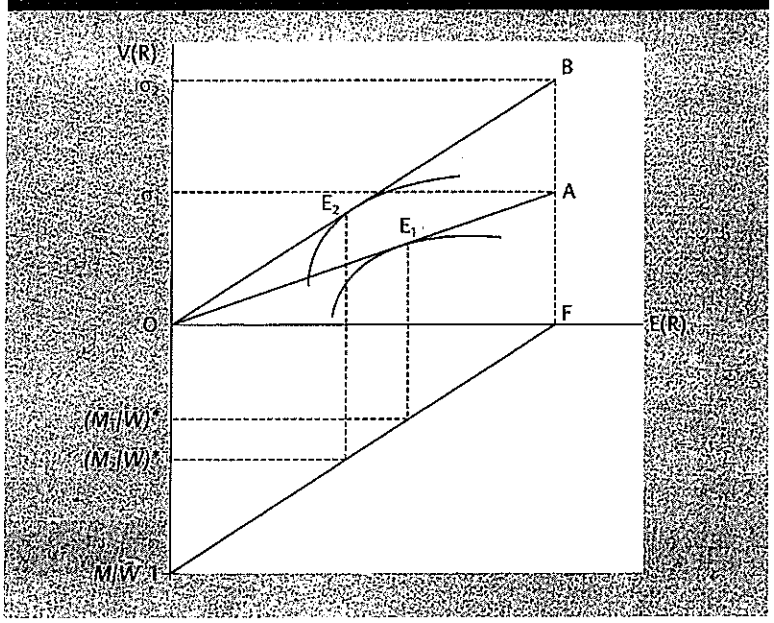


When the interest rate falls, the opportunity locus rotates inwards, reflecting the fact that the interest income available from the portfolio is reduced from a level vertically above F to a level vertically above G while risk is unchanged. The maximum available return is given by G on the horizontal axis, hence the line representing the relationship between proportion of average money balances in average wealth and the return also rotates inwards. Depending on the shape of the indifference curves the proportion of average money balances to average wealth may rise or fall. We have drawn the diagram to show a rise in money balances at E_2, which results in the average level of money balances to wealth increasing to $(\bar{M}_2/\bar{W})^*$. It is consistent with the transactions model to assume that the proportion of money balances will rise as the interest rate falls since the opportunity cost of holding money has fallen, although there is nothing to say that the shape of the indifference curves should imply a fall in bond holding if the investor seeks to maintain a target level of interest income, for example. In the case where the portfolio composition does not shift, this will be because there is a strong income effect which dominates the usual substitution effect arising from changing interest rates.

If we consider a change to the riskiness of bonds in Figure 6.5 we can see that the maximum return would be maintained above point F, since the return is unchanged, but the maximum risk will increase from σ_1 to σ_2, rotating the opportunity locus from OA to OB. With a family of indifference curves as before, the proportion of average money balances to average wealth is likely to increase, reflecting the fact that the same return is associated with a higher level of risk than before.

Throughout the analysis here we have assumed that the indifference curves are

Figure 6.5 A change in the risk of the portfolio in a precautionary model



positively sloped reflecting risk-averse behaviour and concave to the horizontal axis reflecting a tendency to diversify the portfolio. Given that many if not the vast majority of investors demonstrate a preference for less risk for a given return, often by adopting diversified portfolios, this is not unreasonable. There are nevertheless two other possibilities: individuals may be risk-loving 'gamblers' or risk-averse 'plungers'. In the first case their indifference curves will be negatively sloped demonstrating a willingness to accept lower returns in order to indulge in the possibility of unusually high capital gains associated with high risk. The risk lover will choose a corner solution at the highest level of risk on the opportunity locus as shown in Figure 6.6(a), and will thus hold all bonds.[5] Gamblers do not diversify their portfolios since this will reduce the risk and lower the utility derived from the portfolio. Changes to the rate of interest or the riskiness of bonds will not alter the gambler's preference to be holding all bonds, although it will change the level of utility gained from holding a portfolio composed entirely of bonds.

For the risk-averse plunger the indifference curves are positively sloped but are convex to the origin leading the investor to 'plunge' for a portfolio which is completely bonds or completely money rather than adopt a diversified portfolio of both assets. As the diagram is drawn, the plunger opts for all bonds at point *A*, which dominates a diversified portfolio at point *E*. Changes to interest rates cause abrupt changes to portfolio composition since the plunger will opt for either all money or all bonds, changing between the two in response to changes in interest rates and risk.

The model we have considered has some precautionary and some speculative features. We can see that if the majority of investors are risk-averse diversifiers then

Figure 6.6(a) Preferences of a risk lover

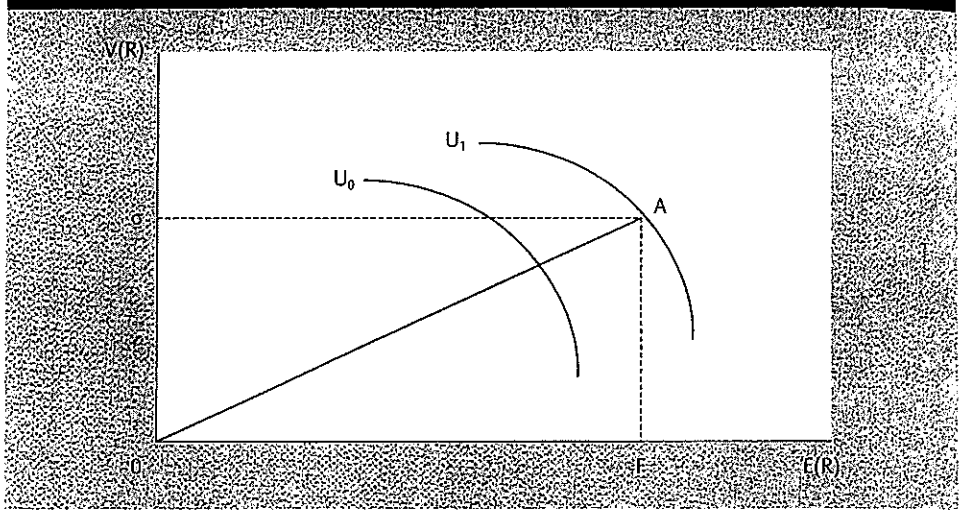
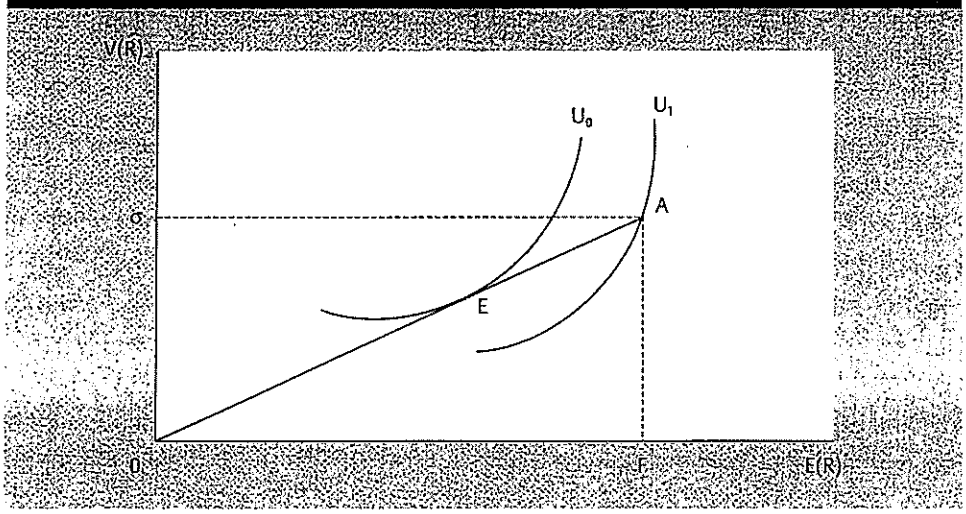


Figure 6.6(b) Preferences of a risk-averse plunger



the model is precautionary in character. If on the other hand the investors are primarily risk-averse plungers or risk-loving gamblers, then the model has the instability associated with the speculative motive. We prefer to describe the model above as a precautionary one which can account for the types of investors, such as pension funds, that seek to maintain a balance between risk and return. In the next section we look at a model which deliberately deals with the instability associated with speculative behaviour.