In March 1952, Harry Markowitz, a 25 year old graduate student from the University of Chicago, published ”Portfolio Selection” in The Journal of Finance. The paper starts by stating:

“The process of selecting a portfolio may be divided into two stages. The first stage starts with observation and experience and ends with beliefs about the future performances of available securities. The second stage starts with the relevant beliefs about future performances and ends with the choice of portfolio”.

Thirty eight years later, this paper would earn him a Nobel Prize in economic sciences.

This topic is a discussion of the results of the study by Markowitz. I attach a copy with these notes for your review.

1. Introduction

This topic deals with the theory underlying diversification decisions. Diversification is a strategic device for dealing with risk. Here we study how the financial manager can exploit interrelationships between projects to adjust the risk return characteristics of the whole enterprise. In the process, we will show why many firms develop a wide spread of activities or portfolios. The term ‘portfolio’ is usually applied to combinations of securities, but the principles underlying security portfolio formation can be applied to combinations of any type of asset, including investment projects.

Many firms diffuse their efforts across a range of products, market segments and customers in order to spread the risks of declining trade and profitability. If a firm can reduce its reliance on particular products or markets, it can more easily bear the impact of a major reverse in any single market. However, firms do not reduce their exposure to the threat of new products or new competitors for entirely negative reasons.

Diversification can generate some major strategic advantages: for example, the wider the spread of activities, the greater the access to star performing sectors of the economy. Imagine an economy divided into five sectors, with one star-performer each year whose identity is always random. A company operating in a single sector is likely to miss out in four years out of five. In such a world, it is prudent to have a stake in every sector by building a portfolio of all five activities.

Diversification is designed to even out the bumps in the time profile of profits and cash flows. The ideal form of diversification is to engage in activities that behave in exactly opposite ways (that is, Contra Cyclical). When sales and earnings are relatively low in one area, the adverse consequences can be offset by participation in a sector where sales and profits are relatively high (called the Portfolio Effect).

The two key messages of portfolio diversification are: look for unrelated activities, and engage in significant diversification.

1. Portfolio Analysis: The Basic Principles

The theory of diversification was developed by Markowitz (1952) - in a paper titled Portfolio Selection (attached with these notes). It can be reduced to the maxim ‘don’t put all your eggs in one basket’. This is a simple motto, but one that many investors persistently ignore. How often do we read heart-rending stories of small investors who have lost all their savings in some shady venture (example the pyramid schemes) or other? Why do more than 50 per cent of private investors persist in holding a single security in their investment portfolios? Perhaps they are unaware of the advantages of spreading their risks, or have not understood the arguments. Perhaps they are not risk-averse or are simply irrational. Rational, risk-averse investors appreciate that not all investments perform well at the same time, that some may never perform well, and that a few may perform spectacularly well. Since no one can predict which investments will fall into each category in any one period, it is rational to spread one’s funds over a wide set of investments.

A simple example will illustrate the remarkable potential benefits of diversification.

Achieving A Perfect Portfolio Effect

An investor can undertake one or both of the two investments, A and B. A has a 50 per cent chance of achieving an 8 per cent return and a 50 per cent chance of returning 12 per cent. B has a 50 per cent chance of generating a return of 6 per cent and a 50 per cent chance of yielding 14 per cent. The two investments are in sectors of the economy that move in direct opposition to each other. The investor expects the return on A to be relatively high when that on B is relatively low, and vice versa. What portfolio should the investor hold? First of all, note that the expected value (EV) of each investment’s return is identical:

EVa = (0.5 \* 8%) + (0.5 \* 12%) = 10%

EVb = (0.5 \* 6%) + (0.5 \* 14%) = 10%

At first glance, it may appear that the investor would be indifferent between A and B or, indeed, any combination of them. However, there is a wide variety of possible expected returns according to how the investor ‘weights’ the portfolio. Moreover, a badly-weighted portfolio can offer wide variations in returns in different time periods. For example, when B is the star performer, a portfolio comprising 20 per cent of A and 80 per cent of B will offer a return of:

(0.2\*8%) + (0.8 \* 14%) = 12.8%

When A is the star, the return is only:

(0.2\* 12%) + (0.8 \* 6%) = 7.2%

Although there should be as many good years for A as for B, resulting over the long-term in an average return of 10 per cent, in the shorter term, the investor would be over-exposed to the risk of a series of bad years for B. Happily, there is a portfolio which removes this risk entirely.

Consider a portfolio invested two-thirds in A and one-third in B. When A is the star, the return on the portfolio, Rp is a weighted average of the returns from the two components:

Rp = (2/3 \* 12%) + (1/3 \* 6%) = 10%

Conversely, when B is the star, the portfolio offers a return of:

Rp = (2/3 \* 8%) + (1/3 \* 14%) = 10%

With this combination, the risk-averse investor cannot go wrong! The portfolio completely removes variability in returns as there are only two possible states of the economy. Any rational risk-averse investor should select this combination of A and B to eliminate risk for a guaranteed 10 per cent return. Here, the portfolio effect is perfect. However, not every investor would necessarily opt for this particular balanced portfolio. Super-optimists might load their funds entirely on to B, hoping for 14 per cent returns every year. This may work for a year or two, but the chances of achieving a consistent return of 14 per cent year after year are very low. The chance of achieving 14 per cent in the first year is 50 per cent, but the chance of getting 14 per cent in each of the first two years is (50% \* 50%) = 25% and so on.

Diversification is usually the safest (and often the most profitable) policy. We will look at how different portfolio weightings affect the overall risk and return. In our example, the opportunity to eliminate all risk arises from the perfect negative correlation between the two investments, but this attractive property can only be exploited by weighting the portfolio in a particular way. Regrettably, cases of perfect negative correlation between the returns from securities are rare. Most investment returns exhibit varying degrees of positive correlation, largely according to how they depend on overall economic trends. This does not rule out risk-reducing diversification benefits, but suggests they may be less pronounced than in our example. As we will see, the extent to which portfolio combination can achieve a reduction in risk depends on the degree of correlation between returns. Later in this topic, we will examine rather more realistic cases, but first we need to explore more fully the nature and measurement of portfolio risk.

Measuring Portfolio Risk and Return

Example