Discussion of portfolio theory

Finance

Discussion of Portfolio Theory Discussion of Portfolio Theory Part The portfolio theory originated with the use of asset-pricing concept as an investment instrument. Investment instrument is an asset that can be bought and sold. The portfolio theory defines that an investor will buy a single risky fund plus a risk-free asset. The combination depends on the investor's risk appetite. Thus, the whole concept of portfolio theory relates to the fund used to buy risky asset. Let us assume, the entire financial market consists of three stocks, those of company X, company Y, and company Z in the following manner; X's market capitalization is $1 billion; Y's is $2 billion, and Z's is $3 billion (INVESTOPEDIA). Thus, total financial market value is $6 billion, and market portfolio would consist of 17 % X stock; 33% Y stock, and 50% Z stock. Corporate investors use the same concept when they build up a portfolio. The above discussion demonstrates that asset is a weight in the portfolio. An investor never buys all securities of the financial market; rather selects a combination of securities. This is when the concept of risk arises. Thus, portfolio theory has two important parameters: weight of an asset in the portfolio and its risk. The concept risk relates to the return on investment. Let us consider a single stock A. The stock A has predicted returns for different economic states as well as the probability of occurring these states. Theoretically three states are considered: boom, average, and recession. Using formulas, one can calculate expected return, E (rA), and risk of the return of the stock A. The risk of return is expressed through standard deviation ?, and in percentage. A portfolio consists of multiple financial instruments, each of them with specific predicted returns. Let us now say, we have three securities in a portfolio: stock B, stock C, and stock D. The portfolio return will be E (r portfolio) = WB x E (rB) + WC x E (rC) + WD x E

(rD). The value of E (r Portfolio) will compensate the risk of each single security. Example (Sepand Jazzi): A portfolio consists of Gold Stock, Auto Stock with relative weight 75 % and 25 %. The return is shown below. Economic Probability Auto Stock Gold Stock Average Stock State Return Return Return Recession 33. 33% - 8 % 20 % 0. 085 Average 33. 33% 5 % 3 % 0. 045 Boom 33. 33% 18% -20% 0. 01 Step 1: Convert predicted returns of two stocks to the return of one average stock. The formula is Average predicted return = Weight of Auto stock x Predicted return + Weight of Gold stock x Predicted return. Using formula, E(r) = ? Ri x P (Ri), where, i = 1, 2, we calculate expected return of the portfolio. The portfolio expected return is E(r portfolio) = 4 %. Using the predicted value of return of Average stock for each economic state and probability, we can calculate the risk of the portfolio. In this case, it is 3. 89 %. This value is lower than individual risk values for Auto stock and Gold stock. Cost of capital is the rate of return of the given investment of a company. The portfolio theory uses Capital Asset Pricing Model (CAPM) to evaluate the cost of capital. This model considers the risk of return and historical return of stock market. The formula for the evaluation of rate of return is Expected rate of return on a security = Rate of risk free investment + (Volatility of a security, relative to the asset class) x (market premium), or ri = rf + ? (rm-rf). Example: Company ? = 1. 4 Rf = 5 %, risk free return E [rM] = 13 %, historical stock market return. E[r] = 5 % + 1. 4 (13 % - 4 %) = 16. 2 % = Cost of capital Part 2 Investment is associated with risk and return, which are quantified, and interdependent; less risk less return, and more risk more return. We can graphically display this dependency on risk – return plane using CAPM model. In this model, risk is expressed through a parameter ?, and return through another parameter E

(Ri). Algebraic expression of the model is E (Ri) = Rf + [E (Rm) – Rf] x ?. Where; E (Ri) = Expected return from an investment, Rf = Risk free return, Rm = Historical rate of stock market return, ? = Risk measurement factor, E (Rm) – Rf = Risk premium, it considers compensation for tolerating extra risk compared to the risk free asset. The straight line represented by the equation E (Ri) = Rf + [E (Rm) – Rf] x ? is called security market line or SML. This straight line illustrates the market risk versus return of the entire market at a certain time (Shapiro). Conceptually the SML equation demonstrates the relationship between expected return and covariance of an asset i. For CAPM equilibrium condition, any asset should appear on the SML. The parameter ? of the equation of i asset is expressed as ? i = ? iM/ ? 2M = Cov (ri, rM)/ ? 2M. It should be noted that ? indicates risk, and ? 2 variance in the portfolio theory. Coefficient ? measures systematic risk of the portfolio. The index M in the formula is the efficient market portfolio, whereas the index i indicates a single stock. Thus, the ? expresses relation of covariance of return of a single stock and market portfolio to the variance of the market portfolio. References Investopedia. Market portfolio. Retrieved from http://www. investopedia. com/terms/m/market-portfolio. asp Sepand Jazzi. (n. d.). Stock and portfolio variance and standard deviation [Video]. Retrieved from http://www. youtube. com/watch? v= q69sfKgsxEc Shapiro, A. (n. d.). Foundations of finance: The Capital Asset Pricing Model (CAPM). Retrieved from http://pages. stern. nyu. edu/~ashapiro/courses/B01. 231103/FFL09. pdf