THEORETICAL ASPECTS OF RISK IN CAPM THEORY

Nedelescu Mihai*
Stănescu Maria Cristina **

Abstract

Risk can be described as a combination between the probability of risk and the consequences in terms of loss or gain because of risk. Risk is an inherent part of all economic activities. The definition of risk (Passenheim, 2010) can be rather difficult as expectations are focused into the future and therefore there is no room for uncertainties. Additionally, these uncertainties could end in an outcome that is either more positive or more negative than expected. CAPM is used to illustrate a particular connection between the degree of uncertainty in earnings flow for a monetary investment as well as level of return, and as a result, it describes how shares are usually valued and how discount rates are established.

Keywords: risk, CAPM, Security Market Line, portfolio, market risk, beta index.

JEL Classification: G31, G32.

Generally speaking, “risk” is a social, economic, political or natural notion originating from the possibility that a future action will cause loss because of incomplete information at the moment of making the decision or an inconsistency in logical reasoning. Risk can be defined as the degree of exposure to an event that may be in favor or at the expense of an activity. It can be described as a combination between the probability of risk and the consequences in terms of loss or gain because of risk. Risk is an inherent part of all economic activities.

An accepted definition of risk describes the possibility that a future event will affect the company’s objectives in terms of costs, planning and resources. Generally, favorable events and their consequences are named “opportunities” and the unfavorable events are named “risks”. Risk represents the possibility of an unwanted event with dangerous consequences to the company’s activity.

* Nedelescu Dumitru Mihai is Lecturer at the Romanian American University, Bucharest. E-mail address: nedelescumihai@yahoo.com
** Stănescu Maria Cristina is Lecturer at the Romanian American University, Bucharest. E-mail address: cristina_voinea21@yahoo.com
Risk also describes the possibility of an anticipated result to be better or worse than the expected one, this feature emphasizing over the fact that risk is equivalent to the variability of possible results.

Most of the time, risk has a negative meaning, investors being interested more in lack of appreciation to gains. Therefore, risk can also mean the possibility of getting better results than expected. Therefore, risk means hazard, the danger of loss, “the possibility of exposing oneself to loss” or a possible lost “that modern policy tries to prevent or fix”.

The risk management procedure is based upon reiteration and feedback, therefore its effectiveness must be constantly analyzed through several strategies: risk avoidance, reduction, protection, risk managing and risk transfer; feasible techniques of performing that consist of taking out insurance coverage or sub-contracting.

The Capital Asset Pricing Model (CAPM) is used to illustrate a particular connection between the degree of uncertainty in earnings flow for a monetary investment as well as level of return, and as a result, it describes how shares are usually valued and how discount rates are established. This model separates the shares’ risk in two categories: systematic and unsystematic risks (Allan Hill, 2010).

**Figure 1: The Inter-relationship of Risk Concepts (Allan Hill, 2010)**

**Systematic Risk** Systematic Market Risk bears its name due to the endemicity characteristic (through the system) and its lack of diversity and predictability. Systematic risk refers to the extent to which share returns vary when the returns on the market as a whole change; it is measured by beta. It relates to general economic factors that affect all firms and financial securities.
and explains why share prices tend to move in sympathy. A share with a beta of 1 tends to rise by 10% for a 10% rise in the index; a share which has a beta of 2 tends to rise by 20% once the returns to the market rise by 10% percent. To put it simply, shares of businesses with increased betas are far more volatile.

No company is completely unaffected by modifications in these variables and therefore the costs of practically all shares tend to move together and are usually positively correlated (Allan Hill, 2010).

**Unsystematic Risk** Unsystematic risk is that portion of complete risk, which is unique to a company (industry); frequently referred to as residual or specific risk, it relates to particular economic aspects, which influence individual industries, firms, securities and projects, for instance the quality of management or equipment failure. Due to the fact that this kind of risk is specific for the company, it is actually possible to reduce the variability of investors’ returns by choosing not to place all funds in a single firm. It could also be removed completely, by means of effective diversification, as it can be seen in Figure 2, where the quantity of unsystematic risk minimizes as the amount of individual types of share in the portfolio increases:

![Figure 2: Risk and diversification (Crowther, 2010)](image)

The implication of Capital Asset Pricing Model (CAPM) materializes upon the fact that investors will not be rewarded for bearing unsystematic risk, considering that these are able to diversify this risk away.

After removing the unsystematic risk, the risk of an individual’s share is evaluated as the volatility of the share relative to the market as a whole (beta), and not as a standard deviation of return.
The basic portfolio concept generally describes the expected return from a dangerous financial commitment as a risk-free come back, plus a premium risk. However, we have noticed that this top quality is determined not by the overall chance of the financial commitment, but only by its systematic risk (market risk).

\[ \beta_j = \frac{\text{COR}(J_{m})\sigma_j}{\sigma(m)} \]  

[1]

Based on the figure which presents the Security Market Line (SML) that decides the industry risk premium (\( \beta \)), several instructors, especially Ho (1963) followed by Lintner (1965), Treynor (1965) and Mossin (1966) were fast to create (quite independently) the Capital Asset Pricing Model (CAPM) as a logical extension to primary basic portfolio theory.

Nowadays, many people regard the CAPM as a superior model of security price behavior compared to others based on the wealth maximization criteria. For example, unlike the dividend and earnings share valuation models of Gordon (1962), Modigliani and Miller (1961) covered in our SFM and SFME texts, the CAPM explicitly identifies the risk associated with an ordinary share (common stock) as well as the future returns it is expected to generate. Moreover, the CAPM can also express investment returns for personal securities in two forms (Allan Hill, 2010):

\[ R_j = R_f + (R_m - R_f) \times \beta_j \]  

[2]

\[ R_p = R_f + (R_m - R_f) \times \beta_p \]  

[3]

For a given level of systematic risk, the CAPM decides the predicted return rate for any financial commitment (security, venture, or portfolio) compared to its beta described by the SML (an industry index). As we shall find out, it also ensures whether personal investments, tasks (or their portfolios) are under or above, comparative to the market (hence its name). The CAPM can therefore
be used by traders or control, who wish to remove unsystematic danger through effective variation and determine the required come back for a given level of non-diversifiable, methodical (market) danger. As an impact, they can customize their portfolio investment strategies to match their personal risk-return (utility) profiles.

The CAPM Assumptions The CAPM is a single-index model because systemic risk is prescribed entirely by one factor, the beta factor. The CAPM is defined by random variables that are normally distributed, characterized by mean expected returns and covariance, upon which all investors agree (Allan Hill, 2010).

The use of the CAPM and beta aspects is simple as far as stock markets methods are concentrated. The style suggests that traders have three options when handling a portfolio: trade, hold, substitute.

![Figure 4: The CAPM and SML (Allan Hill, 2010)](image)

Evidence Regarding the CAPM Like many other concepts, in contemporary economic theory, experts in the CAPM sustain that its presumptions are so limited that they invalidate its results, especially the buyer rationality, the ideal marketplaces and the linearity.

The CAPM is a single-period model, according to the reports for the risk-free rate, the return and the beta aspect, which all seem to create difficulties in practice. The CAPM also implies that traders will create an optimum portfolio. Therefore, the CAPM ignores unsystematic risk, which may be critical to traders who do not. However, as we have emphasized elsewhere in our
research, the appropriate concern is whether a style is suitable, despite its limitations (Allan Hill, 2010).

Although Black (1993) suggested that the CAPM does not perform perfectly for investment strategies with high or low betas, overstating the necessary return for the former and understating the necessary return for the latter, most assessments examine the CAPM for a wide array of beta values (Allan Hill, 2010).

The beta-return features for personal investments can also be used for portfolios. Actually, the beta of a portfolio seems more constant because variations among its components usually cancel each other.

Way back in 1972, Black, Jensen & Scholes evaluated the NYSE, over a 35-year time interval by splitting the list into 10 investment stock portfolios, the first composed elements with the lowest beta factors. According to time sequence assessments and cross-sectional studies, they discovered that the indentify phrase was not similar to the risk-free rate, $R_f$. Moreover, their research unveiled an almost linear connection between a portfolio’s beta and its medium return (Allan Hill, 2010).

Researchers sustained that beta will only be constant as long as a business’s systematic risk continues to be the same, because it runs in the same area; however, following studies using traditional data, to identify the balance of beta over time, proved that, if beta factors are determined from past visible profits, this problem can be solved. The longer the time interval evaluated the better. The more information, the better; which indicates the use of a sector beta, rather than a company beta.

As a substitute to the primary CAPM, Black (1972) also examined a two-factor style, according to which traders could not lend at a risk-free rate but at a rate, $R_z$, described as the return on a portfolio with zero-beta value. This is achieved in comparison with a portfolio whose covariance with the industry portfolio’s amount of come back is zero.

$$R_j = R_z + (R_m - R_z) \times \beta_j \quad [4]$$

The two-factor models achieved according to the research carried out by Black, Jensen and Scholes states that a zero-beta portfolio with an predicted return, $R_z$ surpasses the risk free rate of interest, $R_f$.

Despite further variations to the unique style, the CAPM in its conventional guise continues to entice critique, particularly with regard to its basic assumptions.

For instance, although we assume that all traders can lend or offer at the risk-free rate, this does not mean that $R_f$ represents a risk-free investment commitment in real conditions. Upcoming inflation prices are neither pre-determined, nor do they affect people similarly (Allan Hill, 2010).
Minimal improvements to a portfolio’s elements may also be restricted by significant expenditures that over-shadow their upcoming benefits. The financial system can also be inclined with differential tax rates on earnings and investment profits to such a great extent that different traders will create or join investment stock portfolios that reduce their individual tax obligation (a customers effect).

We estimate an inefficient stock market. As we have mentioned before in this paper and in our SFM section, traders cannot only revenue from legitimate information by paying for the benefit. Having access to specialized data, which can even predict general activities, they may also destabilize the market. On the other hand, even if we believe that the market is effective, it has not always addressed significant changes in information, including models of results submission, takeover action and the political guidelines through to international geo-political activities. The only way to “beat” the market is through speculations or specialized insider details (Allan Hill, 2010). Otherwise, one can only embrace a passive policy of “buy and hold” to monitor the industry trend and wish for the best.

Other forces are also used to invalidate the CAPM. The model indicates that the best possible portfolio is the market portfolio, which can be found on the Security Market Line (SML) with a beta coefficient of one. Personal investments and portfolios with different stages of risk (betas) can be costly, because their predicted rate of return and beta can be in contrast to the SML. On the other hand, all investments will be on the line, because those above or below are either under or over cost as to their predicted return. As a result, the market demand, or the deficit of it, will either generate an increase or drop on cost, until the return suits that of the market (Allan Hill, 2010).

Nevertheless, defining the market seems to be a problem. Little notice is paid to the fact that the CAPM is a linear model depending on the partial equilibrium analysis that subscribes to the Modigliani&Miller (MM) law of one price. Based on their arbitrage procedure, described in the SFM section, it should noticed that two identical resources must be valued similarly.

Consequently, two portfolio elements that lead the same risk level to the overall portfolio are close substitutes; therefore, they should present the same return.

Nevertheless, it could happen that a resource has no near alternative, such as the market itself. In this case, the question is how to identify whether the market is under or overvalued.

As Roll (1977) first mentioned, most CAPM assessments may be incorrect because all stock market indices are only a partially measure of the real
international market portfolio. To put it simply, the industry portfolio should involve security worldwide. If betas and profits resulting from a market list were unrelated, the investments might still be priced properly comparative to the international market portfolio. On the other hand, even if the list were effective (shares with great betas did display great returns) there is no apparent reason to suppose that each constituent’s return is only having difficulties from the methodical risk. A further evaluation of the CAPM states that, irrespective of how one represents the financial commitment market, activities up and down are protected with price changes in the financial commitment strategies of larger companies. As Fama & French (1992) first discovered, it is to these companies that institutional selection financial managers (active or passive) are attracted, though they may underperform relative to smaller companies. The basic description of finance supervisors with millions to invest is that they are hostages to great amounts of money, even in venture situations. They have neither the time, nor the analysis costs to scrutinize numerous organizations “neglected” by the industry with little capitalization (Allan Hill, 2010).

Switching to bear marketplaces, classified by growing methodical risk, multi-national portfolio finance supervisors still have little room to move. According to Mountain and Meredith (1994), the first choice is to entirely or partially liquidate the portfolio. However, “if the whole portfolio were sold, it could be challenging to easily obtain a huge finance without influencing the market. If the only aspect of the portfolio were liquidated, the problem would be what investments to offer. A second choice would be to decrease all holdings to be followed by the next reinvestment when the industry bottoms out. However, the drop in expenditures may have a surplus of 2% to protect deal and commission payment expenditures.” (Allan Hill, 2010)

Clearly, both solutions may be untenable and bring considerable restrictions upon the possibilities to management risk. Indeed, those skeptical of portfolio management usually and the CAPM in particular, regard successful financial commitment as a issue of success rather than thinking, specialized information, or unlikely financial conditions where all costs shift together (Allan Hill, 2010).

Security Market Line (SML) is the line that results, when we plot predicted returns and betas coefficients, is clearly of some significance, so it is useful to provide it with a name. This line, which we use to explain the connection between systematic risk and predicted return in marketplaces, is usually known as the Security market line (SML).

The Security market line (SML) is “a positively sloped straight line displaying the relationship between expected return and beta” (Whitehurst, 2003).
Our main summary was that the required or predicted come back on a risky financial commitment is determined by three things: risk-free rate $R_f$, market risk premium $E(R_m) - R_f$ and systematic risk of the asset relative to average, which we called its beta.

Using the SML, we can write the expected return on the company’s equity, $E(Re)$ as:

$$E(Re) = R_f + \beta_e \times [E(R_m) - R_f] \quad [5]$$

Where $\beta_e$ is the estimated beta. To make the SML approach consistent with the dividend growth model, we will drop the Es denoting expectations and henceforth write the required return from the SML, $R_e$ as:

$$R_e = R_f + \beta_e \times (R_m - R_f) \quad [6]$$

**Implementing the SML Approach** To use the SML approach, we require a risk-free rate, $R_f$, an estimation of the market risk premium $R_m - R_f$ and an estimation of the appropriate beta, $\beta_e$.

The SML approach has two important advantages. First, it clearly tunes for danger. Secondly, it is appropriate to companies other than just those with stable results development. Thus, it may be useful in a wider range of conditions.

There are obviously disadvantages, too. In order to approximate it, the SML strategy needs two elements: the industry danger top quality and the try out coefficient. To the level that our reports are inadequate, the producing price of value will be inaccurate. For example, the value for the market risk premium, 9.1%, is according to about 75 decades of profits on a particular portfolio of shares. Using different routines or different shares could outcome in very different reports.

As a final aspect, just as in the case of the results dividend growth model, we basically depend on it to estimate the long-term prospects, when we use the SML strategy. Both strategies, the dividend growth model and the SML, are appropriate worldwide and they provide identical solutions. Thus, we might have some assurance in our reports.

**Market Stock Portfolios** Determining the equation for the SML is a demand. A portfolio designed for all of the assets in the market will be considered. Such a portfolio is known as market portfolio, and we will mark the expected return as $E(R_m)$.

Since all the assets in the market must be illustrated on the SML, so must the market portfolio designed for these assets. In order to determine where exactly it appears on the SML, we should find out the beta of the market portfolio. Because this selection is affiliate of all of the assets in the market, it
must have an average risk. In other terms, it has a beta that equals 1. We could therefore express the slope of the SML as:

$$SML_{slope} = \frac{E(R_m) - R_f}{\beta_m} = \frac{E(R_m) - R_f}{1} = E(R_m) - R_f$$  \[7\]

$E(R_m) - R_f$ is called the market risk premium. The slope of the SML, the difference between the expected return on a market portfolio and the risk-free rate (Whitehurst, 2003).

**Let us stop for thought:**

- **Total risk consists of unsystematic and systematic risk.**
- **Unsystematic risk**, exclusive to each company, can be removed by collection variation.
- **Systematic risk** is undiversifiable and is determined by the industry as a whole.

These editions between unsystematic and combined risk are important to our understanding of the development of Modern Portfolio Theory (MPT). They approved the beta factors as an evaluation of the only risk that traders will pay a top quality to prevent. This new connection becomes obvious if we restore the CML to type what is known as the Security Market Line (SML).

Unfortunately, the SML only calibrates complete risk not all of which is diversifiable. Luckily, the SML provides investors a lifeline, by discerning between non-systemic and widespread danger. The latter is determined by a beta aspect that actions comparative (systematic) danger, which describes how logical traders with different application (risk-return) specifications can choose between the optimum portfolio by credit or loaning at the risk-free amount (Allan Hill, 2010).

**ACKNOWLEDGEMENT**

The article has been supported by scientific research within the project entitled **PRACTICAL SCHOOL: Innovation in Higher Education and Success on the Labour Market**, project indentified as POSDRU/156/1.2/G/132920. The project is co-financed by the European Social Fund through Sectorial Operational Programme for Human Resources Development 2007-2013 Investing in people.

**REFERENCES**


