

Optimization of the Financial Instruments Portfolio

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Abstract: - The management of financial instruments portfolio is a complex activity that is based on a series of scientific models through which it is possible to assess the financial performance of securities markets, but also the risks to which investors expose themselves. Securities portfolio management aims to maximize profitability risk, relationship to allow institutional investors and individual investment behavior in close connection with the individual's attitude towards risk.

The models dedicated to management of portfolio securities shall establish the prerequisites of an analysis of the investment behavior using only the financial arguments. We have to analyze in a comparative way the characteristics of the models dedicated to managing securities portfolio to see if they are complete.

Keywords: - risk premium, capital market line (CML), multi-factor model (APT), passive and active strategy for asset portfolio management, efficiency of financial markets, top-down model, bottom-up model.

1 Introduction

The financial theory owes this assessment model to the profitability of the financial instruments portfolio developed by the American researchers H. Markowitz¹ and W. Sharpe², who, through the studies that they drew up from 1957-1964, made a synthesis of the results obtained by diversifying the portfolio and the results obtained by the components of the total risk (the systematic component and the specific component). Actually, the CAPM model (Capital Asset Price Market) or the MEDAF model (as it is known in French), provided that the efficient financial market is balanced, the profitability of an asset is determined by a macroeconomic factor, by the general profitability of the market (R_m) and the systematic component of risk, respectively by the beta coefficient (β) of the asset (the profitability of the riskless asset is considered to be a constant).

The CAPM model takes into account a certain number of particular and general hypotheses, such as: the transparency and free nature of information on the financial market; the absence of fiscal and transaction costs; the possibility of borrowing and lending - at a riskless interest - any owed sum of money (the riskless interest rate is the same and it is considered a balance general economic factor); all investors have the same forecast horizon, i.e. only one period; atomicity of financial investments (no financial operator on the market will be capable of significantly influencing the price of an asset).

To these hypotheses, one can add the ones referring to a perfect market: rational behaviour and risk avoidance (the selection of the efficient border); homogenous anticipation which makes it possible for the model to be derived (each investor associates the same probability distribution of each title's profitability); all investments are perfectly divisible and solvable, i.e. they can be instantly transformed into a currency.

2 Literature review

¹H. Markowitz, "Portfolio selection", Journal of Finance, march 1952

²Sharpe, W. (1964) – "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk", *The Journal of Finance*, September 1964

Apart from H. Markowitz, W. Sharpe develops the idea of introducing in the risky but sufficiently developed assets portfolio, a riskless asset in order to generate a potentially minimum risk, i.e. An efficient or market asset. Thus, the profitability of some risky portfolio assets (R_{pf}) can be determined in relation to the riskless asset profitability (R_f), the market portfolio profitability (R_p) and the β coefficient, which evaluates the risk degree for an individual asset in relation to the market portfolios risk:

$$R_{pf} = R_f + (R_p - R_f)\beta_{pf} \text{ where:}$$

$(R_p - R_f)\beta_{pf}$ represents the risk premium.

CAPM aims at quantifying the relationship between risk, profitability and the assessment of the risk premium for a given investor, on a pure and perfect financial market.

Of the two risks, the specific and systematic ones, it is only the systematic risk - determined by the evolution of the market ($R_p - R_f$) - that is remunerated because the specific risk, related to the individual characteristics of the financial asset, can be left aside by simplifying the portfolio.

In his theory, W.Sharpe takes into consideration that an investor accepts a certain level of a financial asset only to the extent to which he/she is remunerated with a profitability rate that is higher than the current level. If profitability is not satisfying, the investor is going to look for another riskless investment, with an equal interest rate for short-term credits. Thus, it results that a portfolio profitability is measured through the positive difference between the portfolio profitability rate and the profitability rate for riskless financial investments. According to W.Sharpe, the measurement of the performance is given by the remuneration of the profitability surplus for the risk unit in relation to the riskless profitability (S). That is why, the higher this rate is (S), the higher the profitability of the portfolio.

$$S = \frac{R_{pf} - R_f}{\sigma}$$

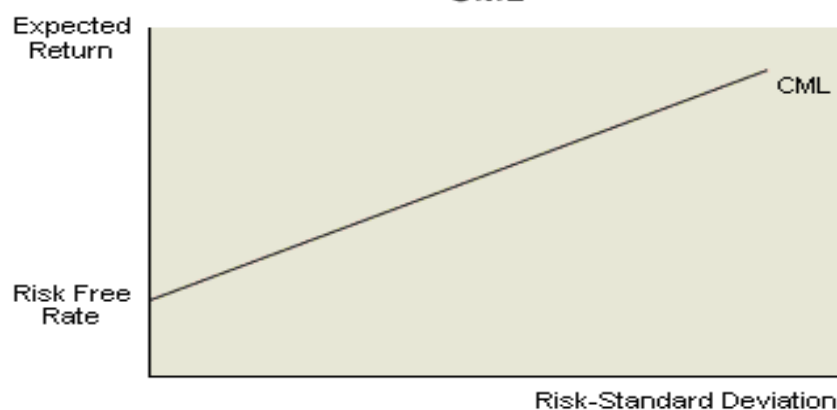
in which:

R_{pf} is the portfolio profitability;

R_f is the profitability of a riskless financial investment.

The CAPM model, being based on the diagonal portfolio selection model (the market model), further provides the existence of riskless assets within the portfolio, which will contribute to increasing the financial instruments portfolio profitability. The advantage offered by these riskless assets (R_f) and the market portfolio (R_{pf}), creates a new efficient border for investments depending on accepting or refusing systematic risk. In other words, according to the CAPM model, in case there is balance, there is a linear relationship between the profitability required for a certain investment and the risk that this investment poses. The graphic representation of the CAPM model is the capital market line (CML- Capital Market Line).

Fig.1 The CAPM model of the capital market line (CML)



The line that unifies the profitability of riskless assets (R_f) with the M tangent point at the efficient margin of the market portfolio (for risky investments), is known as CML (the efficient portfolio line), and it is made up of riskless and risky investments. When the market is balanced, all investments are placed on this line. The unitary price for the systematic risk (the market remuneration for a risk unity), is given by the angular coefficient of the CML. This unitary price for the systematic risk (λ) is given by the relationship:

$$\lambda = \frac{R_p - R_f}{\sigma(R_p)} \quad (3)$$

The portfolio which is thus constituted is going to have the expected profitability of the market portfolio (R_{pf}), which is formed of riskless investments (R_f) and the remuneration by the financial market of the systematic risk ($\lambda \times \sigma(R_p)$):

$$R_{pf} = R_f + \lambda \times \sigma(R_p) \quad (4)$$

On any financial market the efficient management of a financial asset portfolio depends on the forecast related to profitability and the volatile character of financial instruments. Forecast must take into account macroeconomic variations of the general market index, the variations of the interest rate, the inflation rate etc. Similarly, one must forecast the reaction of each financial instrument to different economic and social phenomena.

For the world market, the CAPM model is the most influential economic theory of this modern globalization period. In the last three decades, few economic models have successfully passed from theory to practice. The increase of the integration degree of the international financial market has, anyway, forced economists to further deepen the characteristics of the model and to search for alternatives to it.

The importance of the CAPM model comes from its simple application into practice, which means that it is operational model.

Despite its recognised usage in practice, the CAPM model is far from being a complete and safe model because of its dependence on the “market portfolio”. From a technical point of view, this market portfolio should comprise all the assets that are available in the world. The basic idea of this model is that the income obtained from a capital investment is mainly affected by only one risk source. This source is the market risk, which means the tendency of the assets to move towards the same direction with the capital market.

Of the criticism that may be brought to the CAPM model, we mention:

a. The is no completely riskless financial asset. A riskless financial asset is an asset with a short maturity term and whose income for that period is known beforehand. This is a conventional definition. However, in fact, this asset poses some little risk. According to the CAPM model, every investor can borrow or lend – at a given interest rate – riskless assets. Yet, this is not realistic because at any time it is possible for some investors not to get their payment, which means that they are not in a completely riskless situation. However, even in this situation, the general version of the CAPM model is still valid;

b. A market portfolio cannot be exactly determined. One of this model's shortcomings was defined by Richard Roll³ - from California University in Los Angeles. He proved that a capital market index that is correct for the CAPM model is not the capital market index; this is an index that includes all physical and financial assets in the world (thus, the market includes not only the assets, but also the bonds and all kinds of stock exchange securities and similarly the physical capital properties or other non-financial assets);

c. The CAPM theory is far from being fully confirmed in real life. According to this theory, a portfolio comprised of assets that have a high β coefficient has better results than a portfolio which has a low β coefficient. However, in fact, one cannot state that investors who bought assets with a higher β coefficient enjoyed higher profitability in comparison with those who bought assets with a lower β coefficient. Some specialists appreciate that the β coefficient would function better in periods that have higher stock exchange fluctuations – shares with a higher β undervalue more in case of a bank crash in comparison with shares that have a lower β and vice versa.

Criticism brought to CAPM has led to the creation of new traditionally different models. A first improvement consisted in the elaboration of a multifactorial model for explaining the profitability of the securities, known as APT (Arbitrage Pricing Theory). Thus, whereas for CAPM the determination of securities profitability is accomplished in relation to a single macroeconomic factor – a unifactorial model - the general evolution of the market (i.e. the profitability of the efficient portfolio can be made up of the most representative securities indicated by the stock exchange index), the APT model aims at determining the profitability of securities in relation to a set of factors that can influence it (inflation rate, exchange rate, exchange interest, the growth index for industrial production, work profitability).

3 Extensions of the APT model

The APT model (APT = Arbitrage Pricing Theory) was developed by the American researcher, S.A.Ross⁴ in 1976. This model was the result of the critics brought to the CAPM model, which, for determining

³Richard Roll, “A critique of the asset pricing theory's”, part I. On past and potential testability of the theory”, Journal of Financial Economics, March 1977

⁴S.A.Ross, “The Arbitrage theory of capital asset pricing”, Journal of Economic Theory, December 1976

the profitability of a financial asset portfolio, took into consideration a single macroeconomic factor, i.e. the general profitability of the market. The APT model was defined by Ross as follows:

$$R_{pf} = E(R_{pf}) + \beta_1(E(F_1)) + \beta_2(E(F_2)) + \dots + \beta_n(E(F_n)) + \epsilon_{pf}$$

In which:

R_{pf} is the casual profitability of the portfolio

$E(R_{pf})$ is the casually expected profitability of the portfolio

$\beta_1, \beta_2, \dots, \beta_n$ are the correlation coefficients of R_{pf} in relation to factors: F_1, F_2, \dots, F_n

F_1, F_2, \dots, F_n are casual values for the macroeconomic factors that influence the financial profitability of the portfolio

$E(F_1), E(F_2), \dots, E(F_n)$ is the mathematical (average) expectation for the evolution of the factors: F_1, F_2, \dots, F_n

ϵ_{pf} is the residual term of regression, which indicates the risk that is specific to the “pf” portfolio.

Of the macroeconomic factors that were considered we mention: GDP evolution, inflation rate, interest rate, exchange rate, etc.

One can easily notice the similarity between the APT and CAPM models and especially the generalization that the APT model makes by establishing a link between the expected profitability of an asset portfolio to several risky macroeconomic factors. Despite these advantages, the APT model cannot indicate the number of common risky factor and nor what these risky factors are. The model only tells us that there can be “n” factors, where “n” is much lower number to the one of assets in economy. It is also difficult to determine the expected profitability that is owed to each factor F_n .

These often insurmountable shortcomings make it possible for the CAPM model, and not for the APT model, to be the most used one.

In the model that includes two risky factors, the APT relationship is graphically represented by a plan included in a cube, in which all financial assets should be found on this plan:

4 Strategies for managing international asset portfolios (the active and the passive strategies)⁵

Each portfolio administrator has his own manner of managing a securities portfolio. The purpose is always to meet his customers' expectations as to the diversification of risks and the increase of profitability, while always trying to act better than his competitors. The style of a portfolio administrator, which is the result of his financial culture and of many years of experience, determines the portfolio structure and the way this is managed.

There are two types of strategies that are used in managing a portfolio: passive and active strategies. In the modern theory of management portfolio, the hypothesis of efficient markets is a controversial issue, which has existed ever since this theory was created. The main idea refers to the fact that it is impossible to obtain unusual profits under normal conditions. Consequently, a rational management of securities portfolio must be a passive one. However, financial analysis offers many resources and technical means – with the hope of conquering the market (of avoiding risks that show up due to the factors which act on the market). This is, in fact, the objective of the active management strategy. Although 3 decades have passed since these concepts were created, debates between their supporters have not ceased. In many studies, such as the one published in “Financial Times” seem to indicate better results for the passive strategy.

A. The passive strategy

The passive strategy of portfolio management was created thanks to the CAPM model and the studies published by Markowitz⁶ and Sharpe⁷ in in this domain. The hypothesis of efficient markets, the market portfolio, the principle of local and international diversity, the results revealed by several empirical studies, which indicate the frivolity of active management and, especially, high costs that investors had to make, all have determined a group of institutional investors to question active management.

The hypothesis of efficient markets

The theory of efficient markets, based on the casual nature of price fluctuations and suggested by

⁵Alexandru Olteanu, Florin Manuel Olteanu, “Managementul portofoliului si al riscului pe piata titlurilor financiare”, Editura Fundatia Andrei Saguna, Constanta, 2010

⁶H. Markowitz, op. cit., pct.1

⁷W. Sharpe, “Mutual Fund Performance, Journal of Business, January 1966

L. Bachelier⁸ in 1900, was further developed in the 1960's by E.F. Fama⁹, P. Samuelson¹⁰ and B. Mandelbrot¹¹. The theory of efficient markets furthers, in fact, the theory of financial arbitration. It precedes major innovations in portfolio management, particularly in the creation of index funds. In its three forms (weak, semi-strong and strong), market efficiency confines itself to suggesting that it is impossible to prevent the future variations of securities rates and that the market price of securities reflects all the available and pertinent information, thus allowing that securities to be assessed.

For example, the price of a Daimler-Benz share, simultaneously quoted in New York and Frankfurt, was supposed to reflect all the information related to world economy, auto industry, the Chrysler merger, the Euro-Dollar parity and any other information supposedly influencing the price of these shares.

Weak market efficiency reveals that in a perfect market (one that has no taxes and transaction costs), past and present costs do not allow for future prices to be predicted, which means that technical analysis would be useless.

Semi-strong market efficiency occurs when the current prices of an asset reflects all the public information that is available in relation to that asset. In such a market, the selection of securities cannot ensure a high profitability to the market and market portfolio and, consequently, investors are not able to defend the market. They must confine themselves to following the same trend imposed by the market index in order to have the same profitability.

If there is strong market efficiency, current prices on the market (the market price of securities) reflects all the publicly or privately (includingly privileged) available information. On such a market, nobody, not even the initiated ones, can pertinently predict the future evolution of rates because rates have already integrated all the existing information on the inner value of securities (thus, nobody can make speculations).

According to market efficiency theory, in its strong form, it is not possible to make unusual profits unless there is privileged information. History is full of such examples, in which sending misleading information on the market is followed by its usage by those who are interested in manipulating it.

There are more and more portfolio administrators who have become supporters of financial market theory. Consequently, they set up and manage their portfolios on a relatively long period, frequently changing their structures. This is known as a "passive strategy". The simplest example for such a strategy is portfolio management index strategy.

Strategy for managing index portfolios

An index fund is a portfolio that is set up in such a manner that it imitates a given index, which can be national, such as: CAC-40 in France, BET for BVB (Bucharest Stock Exchange) or Rasdaq for Rasdaq in Romania, or international, such as: EAFE and MSCI-World. The portfolio administrator buys the portfolio shares and, respecting the portfolio structure or the weight which every share has in that index. The argument that is most evoked by index fund administrators takes into account market efficiency and low costs that this strategy implies.

Given the fact that markets are efficient and that strategies, which aim at surpassing indices, are not confronted with real data, why should one pay higher costs if success is not guaranteed?

Buying and selling securities on different markets, transaction costs (including the ones related to the conversion of currencies) are multiplied with the same frequency with which portfolio structure is modified. Usually, the difference between expenses paid by those who adopt a passive strategy and the one that adopt an active strategy varies between 0.30% and 1.5% of the fund value for the former ones. For example, at the beginning of the 1990's the average cost implied by the management of an international index share portfolio, whose value is of 40 million \$, was 270,000 \$, while the average cost of a fund which was actively managed amounted at 770,000 \$. This has made index management more and more popular in the whole world. In England, a quarter of the pension funds are today index funds.

B. The active strategy

Active management is meant to identify profit sources that can offer a higher profitability than the market profitability. The supporters of the active strategy do not believe in the total efficiency of the market. According to them, there are opportunities which allow for a good business thanks to the difference between

⁸L. Bachelier, "Theorie de la speculation", Paris, Gauthier-Villars (1900), repris dans Cootner, 1964

⁹E.F. Fama, "The Behaviour of stock market prices", Journal of Business, 38 (1965); "Efficient Capital Markets: a review of theory and empirical work", Journal of Finance, 25 (1970); "Efficient Capital Markets II", Journal of Finance, 46 (1991);

¹⁰P.A. Samuelson, "Proof that property anticipated price fluctuate randomly", Industrial Management Review, 6 (1995)

¹¹B. Mandelbrot, "Forecast of future prices, unbiased markets and martingales models", "Security prices: a supplement", Journal of Finance, 39 (1966)

the market price of shares and the inner value thereof (the inner value of a share illustrates the present situation of an enterprise and the future benefits that it expects to obtain). This conviction is based on several empirical studies that have revealed the existence of inconsistent functionalities and enigmas in the domain of financial markets. By using sophisticated quantitative methods (APT model, CAPM model, etc.) and by making specialized analyses of economic sectors for every country, active management can identify this disfunctionality and can ensure higher performance through passive management.

The main disfunctionalities are: the seasonal nature of stock exchange profitability and the effects that are specific to enterprises.

Studies show that the analysis of the information can ensure interesting benefits. This analysis is made within a top-down or bottom-up process. Each of them is based on a strategy:

- asset allocation;
- stock selection;
- market timing.

Asset allocation means choosing the countries and different quantities allotted to every country to every asset category (shares, bonds, the monetary market), preferred sectors or industries, companies with higher or lower capitalization, etc.

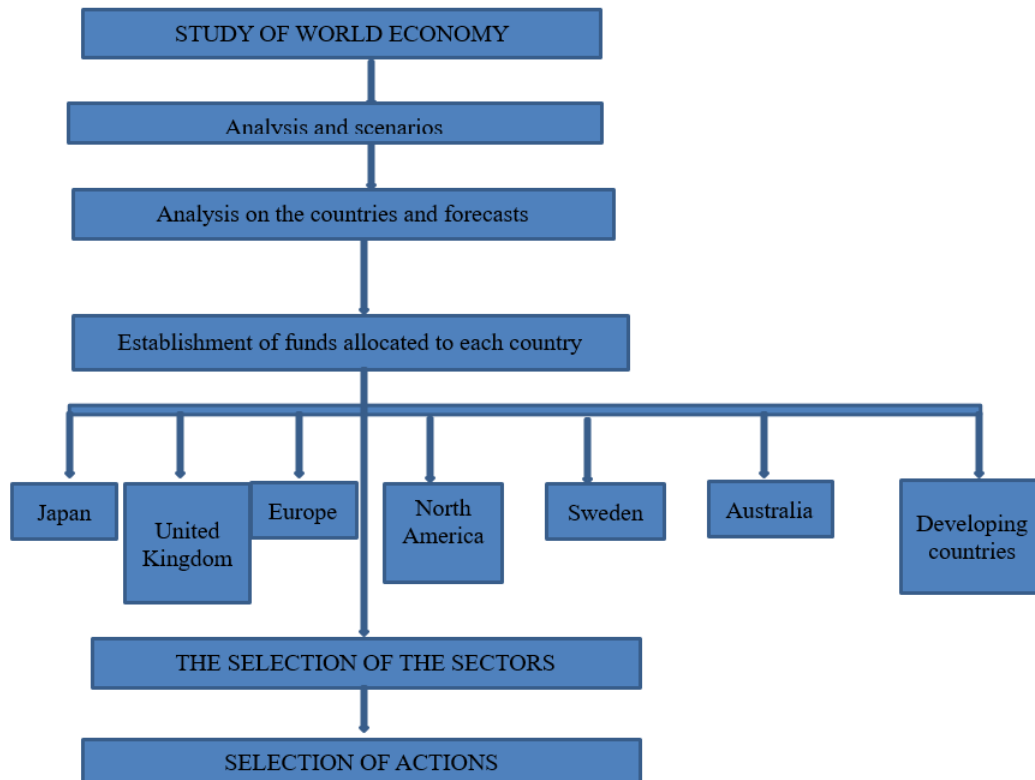
However, it is well known that stock exchange selection relies on the different criteria that are established by the portfolio administrator. Depending on the risk level and the previously established period of time, the administrator tries to select the undervalued stock on the market or the stock that poses an interesting growing potential or any other potential growing index.

Market timing refers to the moment chosen by an administrator to increase or decrease the funds invested in stocks for a certain market (sector, industry, etc).

The top-down process

Portfolio administrators that use the top-down process prefer the asset allocation strategy rather than stock selection. Firstly, they establish the weight allotted to each country, each sector, each industry, and then they choose the stock, thus, considering fixed criteria. For example, an administrator who anticipates a decrease of a national currency can prefer enterprises whose benefits come from a strongly international decentralization. This administrator would choose the stock that corresponds to this criterion depending on the limits of the funds allotted to that country.

The following scheme illustrates the top-down process applied in managing the international share portfolios:



The bottom-up process

The supporters of this process prefer to use stock selection, which seems to ensure important potential gains, no matter the country, sector or the industry that they belong to. The market correlation study has shown that the benefits of international diversity ensure a better currency and country choice in comparison with the stock choice. This has also been confirmed by some analyses regarding investment fund performance. The “performance” obtained in 1997 by the actively managed English pension funds has been explained through a wrong choice of the market, i.e. South-East Asia to the detriment of the USA. The other choice would have ensured good results thanks to the good performance of the US market.

Consequently, the top-down process, based on asset allocation and the specialized analyses made in relation to the chosen country rather than the selection of securities, seems to be better than the bottom-up one.

5 Conclusions

One of the main conclusions drawn after analysing the CAPM model is that there are two types of risks. The former refers to the capital market and the latter to each company. If an investor has a sufficiently high number of shares, he/she can disseminate through diversification the risk associated to companies. But even if the investor had all stocks (no matter the category of stocks) available on a market, he is still exposed to the market risk (i.e. the systematic risk). According to APT theory, these two types of risks are insufficient; thus, there are other categories of risk that can influence asset profitability. These risks are comprised in the APT model through a set of β indices. Each β index comprises the asset sensitivity to a certain market factor.

As to the higher and higher popularity of the passive portfolio management, despite of the number of funds which follow the index structure, most of the local and international funds remain actively managed. Many institutional investors, such as those who administrate pension funds and the ones who administrate mutual funds and insurance companies, similarly use the active and the passive management because neither of the two strategies completely or systematically dominates the other one.

As to the active strategy, many studies made for different markets and periods have revealed the seasonal nature of stock exchange profitability. This seasonal nature is noticed in several months of the year (the effect of January) or weekdays (the effect of Monday), as well as at different day times (the opening and closing effects).

As to the effects that are specific to enterprises, some studies (E.Fama and K.R.French, 1993)¹² illustrated that the securities of small companies (i.e. companies with a low capitalization), whose value market and securities value rates are low and whose level of dividend distribution is high or whose price/benefit rate is low, tend, for example, to accomplish unusual profits that are higher to the ones foreseen through the CAPM model.

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