GENERAL AND SPECIFIC ASPECTS REGARDING THE RELATIONSHIP BETWEEN UNCERTAINTY, IRREVERSIBILITY AND INVESTMENT

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Abstract: The aim of this article is to presents the main aspects regarding the influence of the uncertainty and of irreversibility on the investments. This subject is important because in the nowadays, every investment decision must take account of this influence. Also, the article tries to presents some modalities in which is possible to evaluate the degree of the investment uncertainty and of the investment irreversibility.

Keywords: investments, uncertainty, irreversibility.

1. INTRODUCTION

In the moment in which we make the analysis and the evaluation of the investment projects that will be achieved and exploited for a longer period is necessary to take into account the influence of uncertainty and risk on the investment.

The uncertainty of an investment project is due to the probability that, over time, the demand for the products which will be realized base on the investment, sales and the prices of the products, to suffer changes.

In general, the uncertainty is determined by macroeconomic factors, such as changes in the fiscal policy of the state about interest rate or exchange rate etc. This uncertainty may be related to the future evolution of demand, profits, sales, prices of inputs or outputs etc.

2. GENERAL AND SPECIFIC ASPECTS REGARDING THE RELATIONSHIP BETWEEN UNCERTAINTY, IRREVERSIBILITY AND INVESTMENT

A number of researchers, among which we can enumerate: Avinash Dixit and Robert Pindyck, Andrew Abel, Andrew Carruth etc., have studied the effect of uncertainty and irreversibility on the investment.

Avinash Dixit and Robert Pindyck proposed a new approach based on the investment option value of waiting for better information [1]. This approach is made starting on the analogy with the theory of options in financial markets. A call option gives the right for an investor to buy goods against the determined price. In this situation, this option is considered irreversible.

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In their researches Andrew Abel and Janice Eberly focused on the influence on investments of the uncertainty linked by the future changes of the prices and profits level [2]. Ricardo Caballero has examined the link between the uncertainty of future demand and investments [3].

A delicate problem regarding the establishing the link between uncertainty and investment, is about the measurement of the uncertainty, because the uncertainty is a qualitative variable and for this reason, it is difficult to estimate. In recent years, some ways for the measurement of the uncertainty have been proposed.

One of these modalities is based on questioning the managers of some companies, regarding the future evolution of demand, prices, profits, etc.. Through these questionnaires, the managers of the firms are asked to answer to one or more questions, like:

Do you expect that the demand for the products that will be realized by your company, in the next year, comparing to the level recorded in this year [4]:

- to rise?;
- to remain unchanged?;
- to decrease?

Based on the responses given by the managers to such questions, it is possible to establish a tendency of the evolution of demand. Identifying these trends contribute to the evaluation of the degree of uncertainty.

Another method used to measure uncertainty is GARCH method (General AutoRegressive Conditional Heteroskedastic) model.

This model contains two equations which have the following general form [5]:

$$Y_t = \gamma X_t + \varepsilon_t \tag{1}$$

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 \tag{2}$$

where:
Y_t – the dependent variable in the current period;
X_t – the independent variable in the current period;
γ – coefficient which shows the influence of independent variable on the dependent variable;
ε_t, ε_{t-1} – the error (residual) terms in the current period, respective to the previous period
ω – a dispersion equation constant;
α – the "ARCH" coefficient;
β – the "GARCH" coefficient;
σ_t^2 , σ_{t-1}^2 – dispersion of the dependent variable in the current period, respective to the previous period.

The application of this model to evaluate the uncertainty may take different forms, depending on the dependent variable which is analyzed. For example, to evaluate the Hong Bo and Robert Lensink uncertainty, they used in their studies the following model [6]:

$$SI_{it} = a_0 + a_1 SI_{i(t-1)} + \varepsilon_{it} \tag{3}$$

$$\sigma_{it}^2 = \omega + \alpha\varepsilon_{i(t-1)}^2 + \beta\sigma_{i(t-1)}^2 \tag{4}$$

where:
SI_{it} – the stock market price of company *i* at time *t;*
ε_{it} – serially uncorrelated with mean zero of firm *i* at time *t*;
σ_{it}^2 - conditional variance.

In this situation, the uncertainty proxies were derived from daily stock market prices of individual firms. The results obtain by the Hong Bo and Robert Lensink who studied the relationship between investment and uncertainty in the case of Dutch firms, shows that this relationship is not linear.

The magnitude and the effect of uncertainty on investment depends on a number of factors such as: degree of the investment irreversibility, the market competition, the particularities of the production process, managers' inclination for risk etc.

Uncertainty is a source of risk. The concept of risk means the possibility of manifestation of a future and uncertain event. This possibility can be quantified by probabilities of occurrence of this event that can generate the risk.

Risk and uncertainty are closely linked. No matter how well informed, managers can not eliminate all the uncertainty and implicitly the presence of the risk. Therefore, it is necessary to take into account the uncertainty in the moment in which we take investment decisions. However, the risk may have a positive connotation only if we made a correct identification and evaluation of the risks and if we have a plan to minimize the negative effect of risk on investment.

The investment irreversibility refers to the fact that investment, once materialized, can not be integral recovered by selling them but only partially. Investment that involve the purchase of goods in leasing system are considered to be more reversible than goods purchased in cash. However, this distinction do not allows us to measure the irreversibility degree of various investment

Luigi Guiso and Giuseppe Parigi proposed as a measure of irreversibility the ratio (REV) between the actual sale value of capital stock (V_K^r) and replacement value of this stock [7]:

$$\text{REV} = \frac{V_K^r}{V_K} \tag{5}$$

Investments are more reversible as the actual sale value of capital is closer to its replacement value.

Starting from above relationship, an investment model, which includes both the influence of the uncertainty and of the irreversibility, can be described by an equation like:

$$\left(\frac{I}{K}\right)_{it} = a_0 + a_1\left(\frac{X}{K}\right)_{it} + a_2\sigma_{it} + a_3 REV_{it} \tag{6}$$

where:
I_{it} – the gross investment of firm *i* at time *t*;
K_{it} – the capital stock of firm *i* at time *t*;
X – an exogenous variable which can be considered a determinant of the investment (sales, output etc.);
σ_{it}^2 - conditional variance of company *i* at time *t*.

In general, the cumulative effect of the uncertainty and of the irreversibility is reflected in the decrease of the current investments and in the postponing of the investment projects. There are some important factors that determine the intensity of the relationship between irreversibility, uncertainty and investment.

An important factor is represented by the managers' attitude to risk. The higher is the risk assumed by managers in relation with the investment decisions, the more negative is the effect of uncertainty on investment.

Another influential factor is the financial constraints. Thus, the companies which are subject to these constraints tend to limit or postpone the current and future investments in a larger proportion than companies which do not have financial problems.

3. CONCLUSIONS

From a theoretical point of view, the relationship between investment and uncertainty is quite unclear. From an empirical point of view this relationship shows a negative effect of uncertainty on investment. The results provided by the empirical studies suggest that is a non-linear relationship between investment and uncertainty. Uncertainty influences both the level of investment and the timing of investment.

In the case of reversible investment**,** the moment in which the investment is done is less relevant, and the effect of uncertainty on investment is weak.

In the case of irreversible investment, the effect of uncertainty on investment can be positive. This is because the postponement of investment decision when the uncertainty is too high for other more favorable time, can lead to better economic effects, if the investment decision will be taken at the appropriate time.

REFERENCES

[1]. Drob, C., Investitii directe de capital, Ed. Alma Mater, Bacau, 2009.
[2]. Abel, A., Eberly, J., A unified model of investment under uncertainty, American Economic Review, No. 84, 1994, p. 1369-1384.
[3]. Caballero, R. J., Engel, E., Explaining investment dynamics in U.S. manufacturing: A generalized approach, Econometrica, Vol. 67, No. 4, 1999, p. 783–826.
[4]. Fuss, C., Vermeulen, P., Firms' investment decisions in response to demand and price uncertainty, European Central Bank, Working Paper Series, Working paper No. 347/2004, Frankfurt am Main, Germany, 2004.
[5]. Mun, J., Tools and techniques for valuing strategic investments and decisions, John Wiley & Sons, Inc., Hoboken, New Jersey, 2006.
[6]. Bo, H., Lensink, R., Uncertainty and investment of Dutch firms: an empirical analysis using stock market data," CCSO Working Papers 200001, University of Groningen, CCSO Centre for Economic Research, 2000, p. 2-5.
[7]. Guiso, L., Parigi, G., Investment and demand uncertainty, Quarterly Journal of Economics, No. 10, 1999, p. 195.