

UNIFACTORIAL MODELS OF INVESTMENT

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Keywords: investments, models, capital

Abstract: For explaining investments behavior can be used unifactorial or multifactorial models. This study presents the most used unifactorial models for explaining firm investments. The main characteristic of this models is the fact that investments are explaining by a single determinant (variable), like: Q variable, cash-flow, capital cost etc. The advantage of this models are simplicity and strong theoretical assumption. The disadvantage consists in fact that, in ours days, investments can't be explained only by one single determinant.

The main unifactorial models of investment used for explaining the behavior of investments are: the Q model (Tobin's model), the cash-flow model, the accelerator model and the neoclassical model.

1. TOBIN'S MODEL

At least from a theoretical point of view, the most famous unifactorial model is the Q model (Tobin's model). The Q model of investment starts on the idea that capital investment becomes more attractive as the value of capital increases relative to the cost of acquiring the capital.

This model considers that the level of investments is determined by the Q variable defined as the ratio of the market value of the firm to the replacement cost (or current cost) value of its assets. The use of Q is based on the idea that investment opportunities can be captured by equity market.

The Q model can be written under the following form:

$$\left(\frac{I}{K}\right) = a + bQ \quad (1)$$

where:

I – the level of gross investment;

K – the capital stock.

Even if the Q model is often used in the analysis of investment behavior some authors (Robert Chirinko, Steven Perfect, etc.) are rather cautions when considering this model able to explain investments at a micro or macroeconomic level. The causes of this attitude of reserve are mainly linked to the existence of measurement errors of Q.

In 1994, S. Perfect and K. Wiles, analyzing the q model, showed that it sins not only because of measurement errors concerning the Q variable, but also because of the fact that these errors are co-related.

A particularly source of errors consists in mismeasurement concerns off balance sheet assets, or intangible assets such as the value of a firm's technology as developed by its expenditures on research and development. The value of intangible assets has been found to be incorporated into the market's valuation of firms. Some authors, like Robert Chirinko, Mark Klock etc., find that recognizing research and development improves performance of the Q model of investment.

Another criticism to this model is the fact that the costs of investments financing are not taken into consideration. Under the conditions of using the external funds for the

maintenance of investments to high costs, the model propounded by J. Tobin can't explain anymore the level of investments rate only by the Q variable.

2. THE CASH-FLOW MODEL

A large literature dating back almost 50 years has found a positive relationship between company cash flows and investment. The relationship between investment and cash flow was widely studied in the 1950s and 1960s by John Meyer, Edwin Kuh etc.

The investment model of cash-flow emphasizes the supremacy of internal funds over the external ones concerning the reimbursement of investment expenses.

This model can be written under the following form:

$$\left(\frac{I}{K}\right) = a + b \left(\frac{CF}{K}\right) \quad (2)$$

where:

CF_{it} – the cash-flow realized by the firm;

The cash-flow model was later developed especially by Steven Fazzari, Glenn Hubbard and Bruce Petersen in the 1990s. Using the cash-flow as a measure of internal funds availability, they underlined the importance of financial constraints over the investment process. They found that cash flow tends to have a bigger effect on the investment of firms more likely to face financial constraints and interpreted this as evidence for the existence of information-driven capital market imperfections.

In their study, the three authors drew the conclusion that, when the firms can obtain external funds easily, without paying a high cost, the investment decisions are not sensitive to the dimension of the cash-flow. Yet, when the external funds are hard to get and at a high price, the relationship between investments and internal funds (cash-flow) is very strong.

In 1997, Steven Kaplan and Luigi Zingales denied the researches realized by Steven Fazzari, Glenn Hubbard and Bruce Petersen. The conclusion drawn by S. Kaplan and L. Zingales is contrary to that drawn by S. Fazzari, G. Hubbard and B. Petersen, meaning that the investments of the firms that are not financially constrained are much more sensitive to the cash-flow modification, than those realized by firms with financial problems concerning the same variable.

Stephen Bond, analyzing the relationship between investments and cash-flow, taking the example of many firms from four countries of the European Union drew the conclusion that this relationship differs from country to country.

In 1997, Robert Chirinko shows that even if cash flow variable are considered the stock market variables retain significant predictive power for corporate investment.

We may say, from the above examples, that the use of the cash-flow model is limited because it doesn't allow the unequivocal explanation of the cash-flow sensitivity-investments in relation with the financial constraints to which the firm is submitted or in relation with the asymmetry between the internal and external information.

3. THE MODEL OF THE ACCELERATOR

Another investment model which is more rarely used in its classical form, from a practical point of view, is the model of the accelerator. This model states the fact that the demand for investments is determined by the foreseen volume of the production. From a mathematical point of view, this relationship is expressed as follows:

$$\left(\frac{I}{K}\right) = a + b\left(\frac{Y}{K}\right) \quad (3)$$

where:

Y – the foreseen volume of the production.

This model is based on acceleration principle, which says that the level of output or the changes in aggregate demand determines investment or the change in capital stock.

In time, the model of the accelerator of investments was modified in order to render better the economic reality. The modern forms of this model consist in equation and other variables, such as: the capital cost or the former investments.

4. THE NEOCLASSICAL MODEL

As against the accelerator model, Dale Jorgenson developed a neoclassical flexible accelerator model incorporates the user cost of capital (interest rate, depreciation and price of capital goods) and also the accelerator effect to explain the investment behavior. In the standard cost of capital model of Dale Jorgenson, the firm has a demand for capital and invests until the marginal product equals the user cost of capital.

This approach maintains that changes in cost of capital induce changes in investment behavior by changing the implicit rental price of capital services and further the changes in the implicit rental price of capital services lead to changes in the desired stock of capital:

$$I = a(K^* - K) = a\Delta K = a\Delta\left(\frac{pY}{c}\right) \quad (4)$$

where:

K* – the optimum capital stock;

K – the capital stock;

p – the production selling unit price;

c – the cost of capital use (or the cost of capital renting);

w – the price of work factor (unit wages).

The neo-classical model is wrong somehow as it starts from hypothesis that are not in accordance with reality. For instance, the neo-classical theory considers that investments are reversible and have a neutral risk.

The reversibility of investments means that the firm can turn its fix capital into liquidities any time, thus recovering quickly and almost completely the initial investment (except the capital already cleared off). In fact, in the case of an unprofitable investment, through the disinvestment process, only a small part of the initially invested capital is recovered, and not immediately.

The hypothesis of neutral risk of investments cannot be accepted as the investment, through its own nature, implies a certain risk percentage.

The neo-classical theory is based on the Modigliani-Miller theorem, which considers that internal and external financing are perfectly substitutable and there is an absolute interdependence between the investment decisions and the financing ones (the firm's financial condition). Neither of these hypothesis is in accordance with reality as internal and external financing are not substitutable (the internal ones are better) and the investment decisions are considered in strong connection to the firm's financial situation (the better the financial situation is, the higher is the stimulus for investments).

The neo-classical model predicts that the marginal user cost of capital should be the primary determinant of investment demand but some empirical research has found that cost of capital have little effect on real investment.

For example, Steven Fazzari criticized the neo-classical model, stating that the investments made by firms cannot be analyzed without taking into consideration its financial conditions, and the volume of investments does not depend so much on the capital cost as on its availability.

Even if the neo-classical model of investments has been largely criticized, the empirical evidence demonstrated the fact that the results obtained by its application are much closer to reality than those obtained by using more consistent models, from a theoretical point of view, such as the Q model.

5. CONCLUSION

The unifactorial models, even if they can't fully explain the investment phenomenon, can outline a certain trend or interdependency as far this phenomenon is concerned. Nowadays, the complex multifactorial models are used for a more laborious analysis of the investment process at the firms' level.

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