

A Comparative Study on the Application of NPV and IRR in Financial Market Investment Decision

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Abstract: Investment activities in financial markets are the main part of determining whether an enterprise is profitable or not, with large capital investment and long time. The quantitative analysis of the feasibility of investment activities is of great significance in the operation process. The rational use of index analysis can improve the scientificity of project decision-making. The basic indicators of investment decision-making are mainly NPV and IRR, which are representative and scientific. This paper summarizes the NPV and IRR indicators, compares the advantages and disadvantages of their respective indicators, and analyzes the comparison between the independent project and the mutually exclusive project investment in the decision-making process of the financial market.

Keywords: NPV; IRR; Investment decisions; Cash flow; Income value

1. Introduction

Financial market investment is a long-term investment. In the analysis and decision-making process of financial investment, the investment plan should be formed according to the actual situation and in combination with various indicators. The index of investment decision is the main basis for financial investment analysis, which provides an important guarantee for investors to make decisions. Investment decision indicators can be divided into static indicators and dynamic indicators according to whether they reflect the dynamic changes in the process of investment projects. When enterprises invest in the financial market, there are many uncertain factors, such as long investment time and high investment risk. The market investment environment is changeable. In the early stage of enterprise financial investment, it is necessary to do a good job in market research and use indicators for analysis. In the actual investment decision-making process, enterprises will have many investment objectives, so they will use multiple methods and indicators to analyze. In the process of investment decision-making, enterprises should correctly use the investment index system to analyze the feasibility of projects. The main evaluation indicators used by enterprises are NPV and IRR to measure the feasibility of investment projects. The financial investment projects of enterprises need to be reasonably evaluated and analyzed from all aspects. The project investment decision-making index has important research significance and measurement value. In the current economic environment, we should improve the financial evaluation system, integrate various indicators, adapt to the development of the times, and make reasonable investment decisions.

2. Net Present Value (NPV) and Internal Rate of Return (IRR)

NPV refers to an index in the analysis of financial investment projects, also known as the net present value method. The main calculation process is the present value of cash flow inflow minus outflow. According to the discount rate or rate of return that the enterprise wants to achieve, subtract the initial amount in the early stage of the project and the amount generated afterwards [1]. When NPV is the absolute value, the inflow of the present value of funds is larger than the outflow when NPV is a positive number, and the overall is the inflow of funds and the investment plan is feasible. NPV is zero, indicating that the cash inflow of the investment program can be offset by the outflow. When NPV is negative, it means that the outflow of the investment program will be larger than the inflow. In this case, the credibility of the project should be considered. In the calculation process of investment project, NPV greater than zero means the project is feasible, and the larger the value, the better the investment plan and the better the investment benefit. When enterprises make financial investment, they mainly look at the profitability of investment projects, and NPV index is an index that directly reflects the

profitability. Is the most direct estimate of future cash flow increase or decrease method.

IRR refers to the internal rate of return method, which reflects the determined cash flow. In application, it is necessary to calculate the annuity value coefficient, find the coefficient adjacent to the result, and finally calculate the final result with interpolation method. When using IRR for analysis, the analysis result is independent of the base period. It can be seen that the essence of IRR is the discount rate of zero NPV when the inflow of the present value of funds equals the outflow in the process of investment projects. The year of cash flow conversion will not affect the inflow and outflow, and the values of both will always remain the same. The IRR indicator assumes that reinvestment is based on the internal rate of return, there is no cash flow, and all the income after investment will be used for reinvestment. In fact, when an enterprise makes financial investment, it generally does not reach [2]. NPV is an absolute value, while IRR is a relative value. The main numerical method is percentage. Whether the investment project is feasible mainly depends on whether the IRR is greater than the benchmark rate of return. When the IRR value is large, the expected rate of return is also large, indicating that the profitability of the project is strong and the project is feasible. The function of Net Present Value (NPV) and Internal Rate of Return (IRR), as shown in Figure 1.

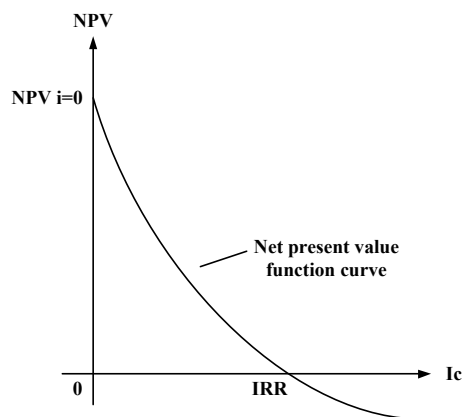


Figure 1: Graph of the functional relationship between Net Present Value and Internal Rate of Return

3. Comparative analysis of advantages and disadvantages of NPV and IRR indicators

In the analysis of financial project investment, NPV index is widely used, reflecting the present value of income, which can directly reflect the situation of investment projects, and the amount of project investment can directly judge the risks in the investment process. At the same time, from the dynamic point of view, it reflects the possible rate of return of financial investment projects, which is easy for decision-makers to understand when making project investment analysis and decision. It is not affected by other rates of return, and the calculation involves the rate of return and rate of return desired by the investment enterprise. At the same time, there are some shortcomings, the calculation process is complicated and tedious, the calculation result is the absolute value index. In the process of investment, if the original investment amount of the investment plan needs to be distinguished, the NPV index cannot be used to distinguish the impact of the rate of return and rate of return on the investment. If the NPV index is continued to be used for decision-making, the decision maker may choose the investment project and prefer the project with a longer term. The size of risks in the process of investment projects is not taken into account, leading to inaccurate decision results [3]. Therefore, NPV index is not suitable for analysis when comparing different independent investment schemes.

The IRR indicator can directly reflect the actual income of the investment project when reflecting the final income results of investors. Analyze the income risk from a dynamic perspective. It is not affected by the initial rate of return. It is determined by specific cash inflow and outflow, so the result is objective. In the actual investment process, as long as the expected cash flow is reached, the final IRR will be determined. The disadvantage of the IRR indicator is that when there are multiple options for investment schemes, due to the calculation method of IRR, multiple results may be generated, and there may be multiple IRRs, or there may be no results [4]. Therefore, the indicator analysis of mutually exclusive financial investment projects may mislead investors. When the decision-makers of financial investment projects analyze the indicators, the costs of short-term and long-term cash flows may be different. In the application of IRR indicator, it is assumed that the cash flow of each period in the investment cycle is reinvested at the current level. However, there are subjective factors in the process

of reinvestment, which will affect the calculation results and lead to inaccurate decisions.

As project decision indicators, both NPV and IRR take into account the time value and the investment benefit of the whole project period, using cash flow as the basis. As two commonly used main indicators, for different investment projects, the analysis of different situations, has been widely used in the analysis and selection of financial investment. In general, NPV index is usually used for decision analysis, because more attention is paid to the future rate of return and rate of return of the enterprise when investing projects, and NPV index can reflect it more directly. NPV and IRR indicators reflect the project situation from different angles. NPV is an absolute logarithmic indicator, while IRR is a relative number indicator. NPV can replace IRR, but IRR cannot replace NPV. The comparative analysis of net present value and internal rate of return is shown in Table 1.

Table 1: Comparative analysis of net present value and IRR

Comparing items	Net Present Value (NPV)	Internal Rate of Return (IRR)
Economic implications	According to the benchmark rate of return of the industry or the discount rate set by the investment entity, the net cash flow occurred in each year of the project calculation period is discounted to the sum of the present value at the beginning of the construction period	The present value of the annual net cash flow of the project during the whole calculation period is equal to the discount rate at zero
Calculation method	$\sum_{t=1}^n (CI - CO)_t (1 + i_c)^{-t}$	$\sum_{t=1}^n (CI - CO)_t (1 + IRR)^{-t} = 0$
Criterion of discrimination	≥ 0	\geq Benchmark return
Application area	Conduct preliminary feasibility study and analyze the impact of product price fluctuation on the scheme excess net income	Conduct preliminary feasibility study and analyze the impact of investment size on the fund recovery capacity of the program

4. Comparison of NPV and IRR index application under different projects

The characteristics of independent project schemes are that they will not affect each other and there is no opposition relationship. When making decision analysis, investors do not need to consider the mutual influence between projects and will not be affected by the investment amount, investment period, etc. Whether this kind of investment project is feasible depends on whether the cash flow in the investment process is effective. When evaluating such projects, the investment project is feasible only when the internal rate of return is greater than the benchmark rate of return. The decision conclusions of using NPV and IRR indicators are usually consistent, and investment risk should be considered at this time. At this time, when using NPV indicators, it is necessary to assume the initial discount rate and make decisions based on the initial requirements that the investment decision-makers need to meet. Due to different discount rates of independent schemes, if NPV indicators are used for analysis, the final results may be different, resulting in inaccurate decision results. If the investment project is a short-term project, it will be more profitable to increase the discount rate. When the investment project is a long-term investment, when the cash flow discount rate is high and the return rate of financial investment project is low, the discount rate should be reduced. When NPV and IRR indicators are used for independent projects, the discount rate increases and cash inflow decreases. Using the two indexes, if the necessary rate of return is lower than the internal rate of return, the feasibility of the scheme will be greater; on the contrary, the scheme is not feasible. Therefore, in the scheme of an independent project, the two indicators will not bring essential differences and the results will not conflict.

Mutually exclusive scheme means that under the influence of external factors, investment project decision-makers can only choose one scheme from many projects. In the analysis of mutually exclusive schemes, the results of NPV and IRR index analysis are often consistent or contradictory. The main reason for the contradiction may be different investment amounts or different investment periods. The investment period of the investment project will lead to changes in the NPV value. If the investment period of the investment project is different, the investment period is short, the NPV value is small, the investment period of the investment project is long, and the NPV value is large, so there is no comparability of the applied value [5]. If the investment period is the same and the initial investment

amount is the same, the conclusions of the two indicators are the same. If the initial investment amount is different, the results will be different. If the NPV and IRR results are different, calculate the NPV difference and select the project with larger NPV. If the investment scale is different, there may be no solution or multiple solutions with the IRR index, resulting in low initial investment, small NPV and high IRR, or large NPV and low IRR, which may lead to errors in decision-making and judgment. When the results of NPV and IRR are different, the difference evaluation of cash flow is used to calculate the difference NPV, and the project with large NPV value is finally selected, that is, the NPV index shall prevail. In the calculation process of differential NPV method, the differential cash flow of different schemes is used to analyze whether the project is feasible according to the level of differential cash flow at last. There are conflicts between IRR index and NPV index in the process of decision-making analysis of financial investment projects, mainly for the following reasons. The method and process assumptions of index analysis are different, especially in the process of project reinvestment. If the IRR indicator is used, the irrationality is more obvious, because the project has not completely and accurately achieved the target rate of return in each period. Due to different investment periods, the NPV indicator did not invest in the financial project according to the target benchmark interest rate, did not conform to the assumed cash flow, and did not combine the actual situation of the project. At this time, different analysis methods and indicators should be used for research and analysis. It is not just about a single indicator. If the scale of two mutually exclusive schemes is the same, the analysis results using indicators are also the same. If the scale of financial investment projects is different, but the profitability is the same, the larger financial investment projects will have a greater rate of return and a higher rate of return. Therefore, financial investment decision-makers should choose the scheme with the largest net present value at this time. Under the condition that the cash flow invested by the enterprise before the project is the same, the enterprise should use NPV indicators to analyze, select a scheme with stronger profitability, try to reduce the cost in the project process, and enhance the overall profitability of the entire investment project. In addition, in the face of different categories of projects, different indicators are used for analysis. If the project is an independent project, both indicators can be used for analysis, and the analysis results will be the same. The two indicators can be comprehensively used for analysis, or the two indicators can be comprehensively analyzed. In the analysis of schemes with the same investment time period and initial investment amount, NPV or IRR should be used for analysis. For mutually exclusive projects with the same investment term but different investments at the beginning of the project, differential net present value method or differential internal rate of return method is used. If the investment term of the scheme is different, the two indexes are used and the mutually exclusive project common life method is adopted for analysis.

5. Conclusion

Investment in financial projects is a dynamic process. Enterprises generally have multiple objectives in financial investment. Investment projects should be evaluated reasonably and scientifically according to the actual situation. NPV method and IRR method should be used together. NPV is the main method and IRR is a powerful supplement to NPV method. The decision-making and evaluation process of financial investment projects is complex. Before making decisions, investment project decision-makers should predict the potential risks of the project, reasonably plan funds, and use a small amount of initial investment amount to obtain high returns.

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