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The Application Limitations and Relevant Amendments of IRR

Gu Zheng, Gao Jing, Zhang Shuangying

State Grid Liaoning Electric Power CO, LTD. Power Electric Research Institute, Shenyang, Liaoning110015, China

ABSTRACT. *The internal rate of return refers to the accumulation of the present value of the net cash flow of the investment project in the entire calculation period, etc. The discount rate at zero hour, which reflects the intrinsic value of the investment project and is not affected by external factors such as the capital market rate of return, has been used as the main indicator of investment project evaluation in practice. In addition, through this concise rate of return, decision makers can easily obtain the characteristics of complex investment projects, and this indicator is easy to understand, which can facilitate communication and exchanges between decision makers and investors, so it becomes an inspection project profitability The main dynamic indicators. However, the internal rate of return law has certain flaws in its method, which makes its application have certain limitations.*

KEYWORDS: *limitation, IRR*

1. Introduction

Change the number of cash flow of investment projects twice or more in each period (positive sign means cash inflow, negative sign means cash outflow), which we call "unconventional cash flow". This type of cash flow is not uncommon in practice. Many projects need to inject some cash after obtaining positive cash flow, and the cash flow in this period may be negative. According to algebraic theory, if unconventional cash flow changes number N times, there may be up to N positive internal rates of return. At this time, the internal rate of return rule no longer applies. For example, a coal mining company has an open-pit mining project F, which needs to invest in mining veins in the first phase; obtain corresponding investment in the second phase return; as the third phase involves land acquisition and meeting the needs of environmental protection laws and regulations, additional investment must be continued. Assume that the cash flows of the four periods are: -1 million, 2.3 million, and -1.32 million. The required rate of return for the project is 8%, so the internal rate of return of the project can be calculated by two, namely IRR1=10% and IRR2=40%. Here we become at a loss when making decisions using the internal rate of return rule, because there is really no reason why one is better than the other[1-3].

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2. Application limitations of the internal rate of return

In addition, even if it is regular cash flow (the number of cash flow changes is one and only once, that is, there is one and only one internal rate of return), we should distinguish between "investment projects" and "financing projects." Among the conventional cash flow projects, the project with negative first-phase net cash flow is an "investment project", and the project with negative first-phase net cash flow is a "financing project". The purpose of distinguishing the two is that these two projects are When applying the internal rate of return, the judgment standard is just the opposite. In investment projects, if the internal rate of return is greater than the expected rate of return (or capital market rate of return), the project will be accepted, and vice versa; for financing projects, if the internal rate of return is greater than the expected rate of return (or capital market rate of return)) Should reject the project, and vice versa. In practice, investment projects absolutely exceed financing projects in number, but we cannot ignore the existence of financing projects, such as expert seminars or large-scale lectures sponsored by cultural companies. Usually participants need to pay membership fees or tuition in advance, namely There is a positive cash flow first, and related expenditures occur during the meeting, that is, a negative cash flow. When applying the internal rate of return rule for such projects, attention should be paid to the judgment standard, otherwise it will lead to decision errors[4-5].

When using the internal rate of return rule to evaluate investment projects, the issue of scale is that mutually exclusive project the unique problem is that when there are two or more mutually exclusive projects to choose, the investment project selected by the internal rate of return rule is not necessarily the best choice. Here is an example, (Example 2): A company faces two mutually exclusive investment projects A and B. The cash flows of the two projects are (unit: 10,000 yuan): Project A (-100, 150); Project B (- 1000, 1200), the company's expected rate of return is 10%. According to the definition of internal rate of return, it can be calculated that the internal rate of return of project A is IRRA=50%, and the internal rate of return of project B is IRRB=20%. According to the law of internal rate of return, the company should give priority to launching project A. But is this the best choice for the company? Obviously not, because according to the law of net present value, the project the net present value of A is 363,600 yuan, while that of project B reaches 909,100 yuan. Project B is significantly better than project A. The key to the misleading conclusion of the internal rate of return is that it ignores the scale of the project. Although the internal rate of return of project A is higher than that of project B, the investment is too small, that is, the high internal rate of return conceals its net cash acquisition The current value of the flow rate is too low in absolute value.

3. Relevant amendments to the internal rate of return

In view of the application limitations of the internal rate of return mentioned above, the following two methods can be used respectively amendments: Modified internal rate of return (MIRR) and incremental internal rate of return (AIRR).

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Modified internal rate of return method (MIRR) Modified internal rate of return method is mainly aimed at the limitation, that is, the situation when the internal rate of return is multi-valued under unconventional cash flow. The general idea is: take the benchmark rate of return (or capital market rate of return) as the discount rate, discount the net cash outflows of each period as the initial investment, and calculate the net cash inflows of each period at the end of the project life cycle. Value, as the final return value, and finally the discount rate when the final return value is discounted and equal to the initial input value is the revised internal rate of return. The advantage of this method is that the calculation process is relatively simple, there is no need to calculate higher-order equations, and there will be no multiple internal rates of return. According to the idea of "equivalent conversion", this method does not change the nature of the project, so it is reasonable. Its evaluation standard is the same as the traditional internal rate of return method, that is, the project with the internal rate of return greater than the expected rate of return is selected. To accept. From the perspective of mathematical analysis, the revised internal rate of return (MIRR) and net present value (NPV) methods will reach a consistent conclusion on project selection. Let's take the first example of multiple internal rates of return for research[6-9].

4. RPQPSO algorithm solves ED problem

The incremental internal rate of return method is mainly aimed at the limitation of the internal rate of return, that is internal revenue the interest rate method ignores the scale of the investment project. The general idea of the incremental internal rate of return method is: first calculate the incremental cash flow of each period, the calculation principle is to ensure that the first period of cash flow is negative, that is, the net cash outflow; then, the traditional internal income is used for the incremental cash flow Rate method, calculate the incremental internal rate of return; finally, compare the incremental internal rate of return with the expected rate of return of the investment project. If the former is greater than the latter, select a larger investment project; if the former is less than the latter, then choose a smaller investment project.

For using the incremental internal rate of return method, the calculation process is as follows: First, calculate the incremental cash flow. According to the principle of negative cash flow in the first period, subtract the cash flow of project A from the cash flow of project B. The incremental cash flow is (-900, 1050).Secondly, calculate the internal rate of return of incremental cash flow, and obtain the incremental internal rate of return (AIRR)=27.78%. Finally, make the final decision. Since the incremental internal rate of return is greater than the expected rate of return (10%), a larger investment project, namely Project B, should be selected. In addition, there will be mutually exclusive projects with the same initial investment scale but different time series patterns in later cash flows, and the direct application of the traditional internal rate of return method will also lead to decision-making errors. For example, for mutually exclusive projects A and B, their cash flows are (unit: ten thousand yuan): Project A (-1000, 1000, 100, 100), Project B (-1000, 100, 100, 1200), discount rate It is 10%. Using the NPV rule, the net cash flows of projects A and B can be

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calculated as: NPVA=669,000 yuan; NPVB=751,000 yuan. Project B is better than project A, but by calculating the internal rate of return of the two projects, It can be seen that IRRA=16.05% and IRRB=12.93%, thus drawing a conclusion that is diametrically opposed to the net present value rule, that is, project A is better than project B. For such decisions, the incremental internal rate of return method can still be used for decision-making. The calculation process is as follows. First, calculate the incremental cash flow. According to the principle of negative cash flow in the first period, subtract the cash flow of project A from the cash flow of project B. The incremental cash flow is (0, -900, 0, 1100). Secondly, calculate the internal rate of return of the incremental cash flow, and get the incremental internal rate of return (AIRR) = 10.55 percent. Finally, make the final decision. Since the incremental internal rate of return is greater than the discount rate (10%), investment project B should be selected.

5. Conclusion

As we all know, the net present value rule is the final rule for investment project decision-making. When using the internal rate of return rule to draw conclusions different from the net present value rule, the net present value rule shall prevail. So, why the internal rate of return law has been so widely used in long-term practice? The reason may be that this method can express the characteristics of a complex project through a single number, and when communicating between project stakeholders the advantage of easy communication, this net present value cannot be achieved.

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