

Better Ways to Make Investment Decisions

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ABSTRACT

With the development of the economy, the focus of the company's development shifts to investment decision-making. The indicators used in evaluating investment options are divided into discounted and non-discounted indicators. Discounted indicators take the time value factor into account, including net present value, present value index, and internal rate of return. On the other hand, the time value of money is not considered by non-discounted indicators, which have payback period, accounting return period, etc. And the approaches of net present value and internal rate of return, as the two methods with the largest range of applications, are often debated on which one is better. This paper will analyse this issue, the advantages and disadvantages of these two methods, and whether the modified solutions have the perfect answer for the company's investment decision.

Keyword: Net present value (NPV), Internal rate of return (IRR), Modified internal rate of return

1. INTRODUCTION

The investment decision of a corporation is the most critical decision of all, so we often say that investment decision failure is the biggest mistake, which can lead to so much trouble or even bankruptcy. Therefore, a fundamental function of financial management is to make good investment decisions. Capital investment usually has a great impact on the company's future cash flow because it ties up a large amount of capital. In a way, investment decisions determine the future of a company, and the right investment decision can reduce the risk and gain profit, while a wrong investment decision can be devastating to the company.

Therefore, these decisions require very careful considerations because they are highly exposed to all kinds of financial and market risks. In order to maximize the profit, net present value (NPV) and internal rate of return (IRR) are two of the most commonly used measurements among all the other financial valuation methods such as payback period and average accounting rate of return. The company makes strategic positioning and industrial layout according to them, clarifies the corresponding investment direction, and looks for suitable investment targets. Screening investment projects, comparing investment alternatives, analysing and evaluating their profitability and risks.

2. NET PRESENT VALUE

2.1 Advantages of NPV

As a widely used tool for investment decisions through decades, NPV no doubt has provided that there is no perfect replacement for this approach. When making capital decisions, companies will still refer to the project's net present value to make choices. The net present value method converts the net cash flows of the project's period into a sum of equivalent present values calculated at a target rate of return. And the algebraic sum of all cash inflows' present value is equal to the project's net present value.

Ross clarified his point that nobody says the NPV rule is wrong, it's just irrelevant in some way and must be modified to be more helpful. NPV is good when it can do its job properly, which is reject the project when it is not good enough for the company. However, NPV can also be bad when it rejects the really good projects. To make things worse, NPV can sometime accept a project when it should be rejected [1].

First, the cash flow of the project can be used instead of profit, meaning that profit is not equal to cash in the capital budget; second, all cash flows of the project are included by NPV, unlike some other capital budgeting methods that ignore cash flows after a specific time; finally, another reason why NPV is better than methods

such as payback period is that the NPV rule takes the time value of money into account.

Naturally, companies will use the NPV approach to make capital decisions. They accept projects with a positive NPV because today's received money equals the NPV, and rejecting projects with a negative NPV will not create any cost loss. Apart from this obvious use, NPV projects can also reflect the firm's current stock price. And it also has an impact on Shareholders' Wealth and Implications for Capital Budgeting Theory [2].

2.2 Drawbacks of NPV

As we all know, optionality is inevitable everywhere when evaluating investments. Thus, the NPV method is not perfect which means it also has many defects. When the economy is not stable, it easily adds more uncertainty with the changing capital market interest rate, making the cost of capital harder to settle. In fact, NPV only uses cash flows to show the total capital gain and loss of an investment project but not the actual return on the project itself. This leads to a tendency for decision-makers to choose projects with massive returns on investment and ignore the fact that a high return on investment is a better investment option in comparison [1].

Since an investor will not choose a project with a negative NPV, it must have a positive net present value when investing. The holder profits from a decline in the one-year interest rate and takes responsibility when the interest rate rises. This results in the project being the equivalent of a call option on a one-year bond. And just because the option is not cash today does not mean it is worthless. Conventional NPV indices do not allow analysts to assign reinvestment rates that are independent of the NPV discount rate. As a result, it is not possible to make a fair comparison of competing projects in many capital budgeting situations because it is not possible to assign a common reinvestment rate [3].

2.3 The modification of NPV

Considering risks based on the NPV method yields two uncertainty decision methods: the certainty equivalent method and the risk-adjusted discount rate method. However, a significant drawback of the positive-equivalent method is that it is not easy to determine the positive-equivalent coefficients when it is poorly operationalized, while the latter combines time value with risk and unreasonably discounts the cash flows. In addition, it is not practical to apply a single risk-adjusted discount rate made by the CAPM model. If there is some flexibility in management decisions, calculating the NPV with a fixed discount rate would be even more inaccurate.

Therefore, there are ways to make NPV less limited, just like Ye and Tiong discussed that some projects face more risks like Build-Operate-Transfer projects. They

need a more dynamic approach to investment decision-making. Systematic evaluation of various investment decision methods shows that weighted average cost of capital (WACC) and mean-variance method can be combined to form the NPV-at-risk method, which incorporates money's time value into mean-variance method and uses WACC as discount rate [4].

The NPV maximization model may still have several different representations, which means it is not perfect. And the use of the particular form depends on the specific situation. For example, if the market is incomplete, then the arbitrage NPV cannot be used. Some of these forms are usually not applicable or consistent with universal standards. [5].

There are two ways to make investment decisions according to the decision-making rules' requirements: one is to calculate the NPV at a given confidence level, and the other is to calculate the confidence level when the NPV is zero. And a systematic review of various investment decision methods suggests that the weighted average cost of capital method and the average variable method can be combined to form the net present value at risk method, which can be used for decision making in privately financed infrastructure projects [4].

3. IRR

3.1 Advantages of IRR

As an expected return on investment, the internal rate of return is also a discount rate that can make a project's NPV equal to zero. The rate of return can be divided into the financial and economic internal rate of return in the project evaluation according to different levels of analysis. Normally, the larger the exponent, the better. Although many companies now choose to invest by using funds, stocks, or real estate, there are still many people who cannot get rid of investment's limitation to the absolute value of returns. IRR provides a basis for judgment as an indispensable tool for this purpose.

Patrick and French explained what IRR is mathematically, and pointed out that a cash flow may not even have a unique IRR. Besides, IRR can be misleading if the outcome is negative, and IRR may rank projects incorrectly when considering the NPV at the same time. They drew the conclusion that the rate of return alone is not enough to be the determined factor of the investment decision, the timing of cash flows, is also important in decision making [6].

The project's life to its total investment can be related by the internal rate of return approach, indicating the rate of return for the project. Comparing the internal rate of return to the investment rate of return benchmark, we can easily get to know whether it is a project worth investing. The IRR approach will not be limited to the terms of borrowing and can be seen as the borrowing rate cap

when the terms are not clear. However, the internal rate of return is a ratio, not an absolute value. Because of its size, a project with a low IRR may also have a high NPV. Hence, it is essential to think about the IRR along with NPV when selecting the option for comparison.

3.2 Drawbacks of IRR

As we mentioned above, IRR is a ratio indicator that cannot show the absolute level of return and can often mislead investors' judgment. Unlike NPV, as a ratio, IRR cannot be used independently. To use the IRR method for investment analysis also have to know the company's capital cost. If the final result is that the IRR is greater than the company's cost of capital, then the project can be accepted; otherwise, the project should be rejected.

Brown clearly listed the problems that IRR has and summarized as four main problems. The first one was the "No Solution Problem", which means IRR may have no result when the cash flow is not normal. The "Multiple Solution Problem" indicates that the convex of IRR may come cross the x-axis twice. The "Ranking Problem" tells that the IRR may have different result with NPV, and the "Scale Problem", which says the IRR cannot rank the projects if they have different scale [7].

Therefore, the disadvantages of IRR can be summarized as follows:

- IRR cannot distinguish if the project is reinvested or financed.
- IRR cannot reflect the size of the funds, for example, a 1% return on \$100 investment and a 50% return on \$1 investment.
- IRR cannot distinguish the time series of funds.
- IRR might have multiple answers or no solution.

And the reliability of IRR depends on several assumptions, an important one being the one mentioned above that the reinvestment rate of return is equal to IRR.

3.3 IRR vs. NPV

Osborne discussed about a long exist question: NPV or IRR, which is better and accurate when making investment decisions. Hence there is a new approach to understand this debate. One of the benefits of the new approach is that it is very friendly to the solution proposed for this problem. Although this analysis still supports NPV as an academic preference, it illustrates that IRR is also a fundamental concept. This is because the net present value covers all internal rates of return that may exceed the cost of capital. [8].

We can see that both of them consider money's time value, but the NPV method is the money that can be earned during the project period, while the IRR method is the maximum depreciation rate that we can afford during

the project period, which is the maximum annual interest rate that we usually refer to as the loan investment.

For instance, the internal rate of return is 20 percent, which means the maximum rate of depreciation that we can afford is 20% per year; and if we decide to borrow money for this investment, the maximum annual interest rate we can take is 20 percent, making this project is worth invest. And when the currency devaluation rate is only 5%, the remaining 15% is our profit. However, this seems to be talking about margin errors and resilience to risk, but actually this can also be talking about marginal profits and profitability. The other thing is that NPV is a specific value in the investment project, while IRR is a ratio. To some extent, as a relative value, the IRR is definitely better than the absolute value because the latter does not consider the investment's size. For example, the NPV of a \$1 million project is \$500,000, and the NPV of a \$10 million project can also be \$500,000, but the project's profitability is totally different.

4. MIRR

4.1 The modification of IRR

Magni then suggested to look at IRR in a new perspective, which is average internal rate of return (AIRR). This is quite different from the approach that considers the concept of IRR as the centre, as it discards the IRR equation, guarantees the flexibility of description and corrects decision making. The AIRR approach addresses the long-standing problem of finding meaningful rates of return on the economic level that help decision-makers make the right decisions [9].

Lin proposes a substitute formula for IRR that maximizes the firm's value under specific conditions, which is called the modified internal rate of return. The advantage of MIRR over traditional IRR is that it provides a unique solution making the NPV and benefit-cost decisions result in the same outcome and does not make undue implicit assumptions about the impact of intermediate cash flows as some other decisions do. [10].

IRR cash flows are also classified as positive or negative. Positive cash flow represents the cash the investor receives during the investment period and how the use of this cash affects the rate of return. For example, the money acquired during the investment period can be reinvested or used to purchase treasury or make stock transactions. On the other hand, a negative cash flow is reinvesting additional funds. The acquisition of these funds is also considered a financing activity that has to consider the new interest rate. The MIRR can be calculated as the final value of the FV under the reinvestment rate of all cash inflows for the period, which also means how much income will be generated after the investment inflows for the period. All cash outflows for

these periods are to be calculated using the financing rate of the present value PV.

4.2 Pros and Cons of MIRR

Kierulff believes that even though MIRR is more difficult to understand and calculate, it will gain public acceptance over time, just like NPV. In fact, the idea behind MIRR is easy to understand through the formula but more challenging in reality because of the investment rate to be estimated. The MIRR also effectively solves some of the NPV and IRR problems. As with traditional IRR, an investment project is economically attractive when the MIRR exceeds the hurdle rate, it provides a more accurate measure of which investment alternatives is more attractive, which depends not only on the return of the investment itself but also on the expected return of the cash flows it yields [11].

Lefley observes that IRR remains the most popular investment decision method despite all the flaws. The newly researched modified internal rate of return can address some of the weaknesses of IRR. If a company's cost of capital is less than the reinvestment rate, then the actual rate of return is underestimated by the MIRR. And if the company's cost of capital and the project's MIRR is very different, then the determination of the project cycle can have a significant impact on the actual MIRR. Like IRR, MIRR prefers projects with short payback periods and high initial cash flows, although it may have some slight differences from traditional IRR. The application of the method in the industry has not yet been reported in the academic literature. Only time will tell how popular it will be among the practitioners [12].

MIRR is essentially the same as IRR, except it is more refined because it separates the discount rate of invested capital from the reinvestment rate of return on earnings. MIRR made the assumption that positive cash flows are all reinvested at the company's cost of capital as the rate of return, while the initial inputs are obtained through financing, and the interest rate is the company's cost of financing. This indicator is relatively closer to reality and can solve the problem that IRR may have multiple solutions. However, we rarely use MIRR in practice, mainly because it is estimated to be "complicated". Because the determination of the rate of return and discount rate itself is more trouble, MIRR requires to confirm the cost of financing and the cost of capital. Which indeed has some impact on efficiency.

4.3 Adjusted Internal Rate of Return

Hajdasiński suggested that MIRR is based on the reinvestment assumption; however, these two realized this assumption differently. Although various MIRR can be used to determine the absolute profitability of investment projects successfully, they are not suitable for screening mutually exclusive projects. Because just like

IRR, MIRR does not reflect project size. To solve this problem, Shull proposed a downloadable process to adjust MIRR to mutually exclusive projects so that the adjusted MIRR (ADDMIRS) could calculate the size of projects. Thus, allowing direct and NPV-compatible project ranking [13].

5. CONCLUSION

Compared with the traditional IRR, the modified IRR assumes that all investment returns are reinvested at a certain discount rate for the investment, making its reinvestment assumption more reasonable. The main problem of multi-IRR is solved at the same time. However, due to the different investment scales, the modified index still cannot solve the problem of contradicting the NPV index.

But after all, business is not natural science, and efficiency is often more important than accuracy. Although there are different voices on the need for the existence of MIRR, it is a more accurate indicator of the profitability of future projects anyway. Therefore, decision-makers can use MIRR to check whether the forecast made by IRR is too optimistic. The modified internal rate of return will undoubtedly prove its value over time, just like other approaches did.

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