A Short Note on Time Value of Money, Risk Premium and Investment Decision Making
(Relevant to AAT Examination Paper 4 – Business Economics and Financial Mathematics)

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Financial decisions can be divided into two broad types: investment and financing. The former involves a current commitment of money or other resources (cash outflow) in the expectation of receiving future benefits (cash inflow) while the latter involves the opposite pattern of cash flows. Both decisions, however, share one common feature: the cash outflows and the cash inflows are separated over time and valid comparison of the cash flows accruing to an investment can only be made if all the cash flows are moved to the same point of time (usually the point at which decision is made; that is, t=0 on a cash flow timeline).

The fact that virtually all financial decisions involve moving cash flows over time highlights the fundamental role of time value of money and risk in determining the value (or how much to pay) an investor should place on the various types of prospective cash flows arising from a financial decision.

In this article, we discuss the fundamental roles played by time (value of money) and risk in financial decision making.

Time value of money and nominal risk-free rate of return

When presented with a choice between receiving a dollar today or sometime in the future, an overwhelming majority of people tend to pick the former. The assumption that underlies this common-sense choice is the idea that having the use of money for a period of time, like having the use of a good such as a car, is valuable. The earlier receipt of a dollar is more valuable than a later and the difference in value between the two is commonly known as the **time value of money**. It can be explained by the interest earned by putting the money into a bank accountthat pays a **risk-free rate of return**. This would mean a dollar put into a bank account for one year earning 1% yearly interest would grow to $1 x (1 + 0.01), leading to the well-known phase “one dollar today is worth more than a dollar in the future”.

If the positive risk-free interest rate explains why a dollar today must be worth more than a dollar in the future, the key question becomes: Why is the rate of return on a risk-free asset (also known as risk-free rate) positive? There are two basic reasons:

1) People prefer to consume goods and services today rather than waiting to consume similar goods in the future. In other words, people are impatient. As a compensation for their waiting (think about putting money into a bank account for one year), people would only be willing to make a risk-free investment for a period of time if receiving a positive rate of return. This compensation is commonly known as the **real risk-free rate of return (RRFR)**.

2) Since we are living in a world with inflation (the phenomenon that the general price level goes up over time persistently), people would only put their money into bank account (a risk-free asset) if they get a return which not only compensates for their time of waiting, but also for the loss of purchasing power due to the rising price level during the period the money is put into the bank account. This compensation for inflation-induced cost is commonly known as the **inflation premium**.

The **sum** of the nominal risk-free rate of return and inflation premium is called the **nominal risk-free rate of return (NRFR)**. A daily real-life example is the interest earned from a bank deposit. Note that, all else the same, interest rates on long-term bonds (10-year government bonds) in general are higher than interest rates on short-term bonds.

Risk and risk premium

Rather than putting all their savings into (virtually) risk-free bank deposits and other risk-free assets such as short-term government securities (e.g. US Treasury bills), most people (investors) also invest in risky assets such as stocks to try to earn higher returns. However, they only do so (?) if they get sufficient compensation for bearing the risk associated with the risky assets. Since different assets carry different risks (defined as the uncertainty associated with the cash flows provided by the asset) (for example, shares in general carry more uncertain cash flows than bonds), people investing in risky assets will demand a return (called **required rate of return**) which is made up of the following components:

1) Nominal risk-free rate of return (NRFR)

2) Risk premium of risky asset i (RP_i)

Note that the NRFR is common to all assets no matter whether they are risk-free or risky. Risk premium, on the other hand, is asset-specific as different assets have different risks. Moreover, the NRFR is observable in the market (quoted by financial institutions and hence need not be estimated by investors themselves) but the risk premium is not observable and has to be estimated. Investors possessing the same information may come up with very different estimates for the risk premium of an asset and hence return demanded for the asset. This is the main reason for the wide range of value estimates assigned by different market analysts on the same risky asset, such as stocks.

Example

Consider an investment that requires an outlay of $100,000 at the beginning of the year. The cash flow from the investment at the end of the year is $112,000. Should the firm go ahead with the investment?

Case (i): The firm needs to borrow the $100,000 at yearly interest rate of r%.

Decision:

Borrow and invest if $112,000 ≥ $100,000 x (1+r%) = FV (future value)

Do not invest if $112,000 < $100,000 x (1+r%)

or:

Accept the project if PV (present value) = Value of the project = $\frac{\$112,000}{(1+r)}$ > $100,000

Reject the project if PV = Value of the project = $\frac{\$112,000}{(1+r)}$ < $100,000

or:

Accept the project if NPV (net present value) = $\frac{\$112,000}{(1+r)}$ - $100,000 > 0

Reject the project if NPV = $\frac{\$112,000}{(1+r)}$ - $100,000 < 0

Points to note:

- "Value" goes by many names: "worth", "the maximum amount willingly paid by the buyer", "the minimum selling price demanded by the seller", present value (of the project cash inflows), etc.

- "r" is the interest rate charged on the bank loan used to finance the project; in other words, it is the cost of capital of the project. It is the sum of the risk-free rate (NRFR) and the risk premium for the project (and depends on the riskiness of the project).

- The value of the project $(\frac{\$112,000}{(1+r)}) > \$100,000\ (\text{cost})$ is NOT ONLY profit-making ($112,000 - $100,000) BUT ALSO **value-creating** in the sense that $112,000 > (cost of the project + interest cost). This means that "borrow and invest" is a better option than "Not borrow and not invest"; a positive NPV project leads to the efficient allocation of the firm's limited resources.

Case (ii): The firm has the available cash which it can invest to earn a yearly return of k% from projects of similar risk.

If the firm invests in the project, it will receive $112,000 at the end of the year

If the firm invests elsewhere, it will have $100,000 x (1+k%) at the end of the year

Decision:

Accept the project if $112,000 ≥ $100,000 x (1+k%)

Reject the project and invest elsewhere if $112,000 < $100,000 x (1+k%)

Points to note:

- The k% is the **required rate of return** of the project, given its risk.

- It is also the return that the company can expect to earn from other assets of similar risk. Since the firm could earn k% elsewhere bearing the same risk, it would require the project at hand to earn at least k%. It follows that the required rate of return of the project can also be referred to as the **opportunity cost of capital** of the project.

Conclusion

Every decision has financial implications. Finance is concerned with the efficient allocation of limited resources over time through investments and financing, which can be achieved by consistent value-creating decisions making by economic entities (individuals, firms and governments). This can only be achieved by considering all the costs (cash inflows) and benefits (cash outflows) arising from the decision. The difference in value arising from the earlier receipt of a dollar has two components: time (value of money) and risk.

They render the choice among various economic plans dependent not only on the magnitudes of receipts and expenditures associated with each of the plans but also upon the timing of these inflows and outflows. It follows that mastering the concepts of time value of money and risk is the first step in making good investment decisions.