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Invention of NFV Technique and Its Relationship with NPV

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ABSTRACT: The capital budgeting techniques have the real life impact in case of decision making process. The available techniques are traditional techniques: Pay Back Period (PBP), Average Rate of Return (ARR) and discounted techniques: Net Present Value (NPV, Internal Rate of Return (IRR), Profitability Index (PI) and Discounted Pay Back Period (DPBP). Here researcher has introduced a new capital budgeting technique: Net Future Value (NFV). The researcher focused NFV basis on borrowing phenomenon and investing or lending phenomenon. The researcher has characterized this technique that if the Net Future Value (NFV) of a borrowing project is negative, the project has the positive worth for the outsider investor(s) and /or the outsider lender(s) and negative worth for the borrower(s) otherwise positive NFV creates negative worth for the investor outsiders and /or the lender outsiders and positive worth for the borrower(s).And if the NFV of an investing or lending project is positive, the project has the positive worth for investor(s) or lenders and negative worth for the borrower(s). The researcher viewed NFV as the compounding technique of capital budgeting. The researcher found the positive relationship between NPV and NFV in case of investing or lending project or investor or lender perspective but negative relationship between NPV and NFV for borrowing project or borrower or debtor perspective.

KEYWORDS: NFV, NPV, technique, borrowing, investing, relationship and project.

1 INTRODUCTION

This paper focuses the determination of NFV and relates the comparative description with other methods of capital budgeting. Many researchers viewed the determination of terminal value or future value of cash flows but they did not determine net future value (NFV) and its relationship with other methods of capital budgeting. Compounding is the process of determining the future value (FV) of a cash flow or a series of cash flows and the future values are equal to the beginning amount plus the interest earned [1]. Short term rates accurately reflect the expectations of future rates of inflation but his methodology and conclusions have been disputed by several rebuttals [2]. Net present value method can be treated as representative method for capital budgeting evaluating, and for all other's it can be sad that they are "inferior with regard to NPV method [3]. The NPV can be attained using the discounted cash flow (DCF) approach. Wee proposed a replenishment policy for deteriorating items with a price-dependent demand [4]. Wee's model was extended to consider DCF with finite planning horizon and known replenishment cycle [5]. DCF approach in base stock inventory system is evaluated by Hill and Pakkala [6]. In capital budgeting, financial manager must consider risk. Risk is measured like combination probability of unwonted occurrence and consequences of realization of that probability. In capital budgeting process there are two sorts of risk systematic and unsystematic risks for more about risk. Also there are many studies that where conducted to check risk management and possible criteria for avoiding risks. It has been shown that manger can and do avoid risks using different techniques. Most of them, one more, emphasized the importance of alternatives, collect more information, check different aspects of the problem, and actively work on the problem to reduce risk [8]. Gul and Ekinci analyze the empirically the relationship between nominal interest rates and inflation by using high frequency data of nominal interest rates and inflation of Turkey. They found that a long run relationship between nominal interest rates and inflation exists [9]. Even though the payback method has some cons associated with it, the simplicity of the method can allow it to be used as a filter for those

projects which should go on to a more in-depth method. If a project is not recommended based on the payback method, the chances are pretty high the project should not even be considered for the other methods [10]. Accounting rate of return also known as Return on Investment (ROI), use accounting information revealed by the financial statement to measure the profitability of an investment and number of period taken in recovering the investment outlay on presented value basis is the discounted pay back period. Discounted payback is computed by adding the present value of each year's cash inflows until they equal the investment and pay back period is defined as the number of the years required to recover the original cash outlay invested in the project [11]. The classic vehicle for analyzing the impact of taxation on investment is Jorgenson's user cost of capital, an expression that incorporates prices, tax provisions, financing costs and depreciation [12]. The real options approach embraces the concept of uncertainty. There must be uncertainty in terms of future cash flows deriving from the investment, and management must have flexibility to assess this uncertainty as it evolves [13]. Despite the emergence of new methods, the traditional ones, NPV and IRR are still the most popular [14]. However, it can be argued that a shift from IRR methods towards the NPV methods has occurred from the 1970s to 1990s. Additionally, it holds no risk of ambiguous roots, as it is in the case of IRR. On the other hand, IRR depends only on the properties of the cash flow stream, having nothing to do with the prevailing discount rate, which is sometimes troublesome to calculate. Considering these factors, it seems that both methods have their place in investment appraisal, but in different situations. If a project shows a positive outcome, it is accepted. However, in the case of several investment alternatives showing positive NPV, the candidates may be ranked according to their profitability index (PI) that PI is the present value of NCF divided by the initial investment [15].

2 MATERIALS AND METHODS

This was fundamentals research in nature. To formulate the NFV that considers the time value of money. The researcher invented the following equations basis on borrowing project or borrower's perspective and investing project or investor's or lender's perspective which were applied for calculating the NFV on both meadows. In this study, the researcher assumed the data of bank. The NFV's equations were applied on these data to find the values of NFVs. In these data, the researcher had applied the other methods of capital budgeting. Researcher compared the value of NFV with the value of NPV and presented the relationship of NPV with NFV. This study focused the effect of inflation on NFV as well of NPV. This study had pointed out decisions for the value of NFV.

2.1 FOR BORROWING PROJECT/ BORROWER'S PERSPECTIVE

Application for both mixed stream cash flows and even cash flows and where cash outflows occur at the end of the period.

$$NFV=\sum_{t=0}^{mn} CI_0\left(1+\frac{r_d}{m}\right)^{mn-t}-\sum_{t=1}^{mn} CO_t\left(1+\frac{r_d}{m}\right)^{mn-t} \quad 1.1$$

Application for even cash flows only and where cash outflows are ordinary annuity

$$NFV=\sum_{t=0}^{mn} CI_0\left(1+\frac{r_d}{m}\right)^{mn-t}-CO_e\left[\frac{\left(1+\frac{r_d}{m}\right)^{mn}-1}{r_d/m}\right] \quad 1.2$$

Application for both mixed stream cash flows and even cash flows and where cash outflows occur at the beginning of the period.

$$NFV=\sum_{t=0}^{mn} CI_0\left(1+\frac{r_d}{m}\right)^{mn-t}-\sum_{t=1}^{mn} CO_t\left(1+\frac{r_d}{m}\right)^{mn+1-t} \quad 1.3$$

Application for even cash flows only and where cash outflows are annuity due.

$$NFV=\sum_{t=0}^{mn} CI_0\left(1+\frac{r_d}{m}\right)^{mn-t} - CO_e\left[\frac{\left(1+\frac{r_d}{m}\right)^{mn}-1}{r_d/m}\right]\left(1+\frac{r_d}{m}\right) \quad 1.4$$

2.2 FOR INVESTING OR LENDING PROJECT/ INVESTORS OR LENDER'S PERSPECTIVE

Application for both mixed stream cash flows and even cash flows and where cash inflows occur at the end of the period.

$$NFV=\sum_{t=0}^{mn} CI_0\left(1+\frac{r_d}{m}\right)^{mn-t} - \sum_{t=1}^{mn} CO_t\left(1+\frac{r_d}{m}\right)^{mn-t} \quad 2.1$$

Application for even cash flows only and where cash inflows are ordinary annuity

$$NFV=CI_e\left[\frac{\left(1+\frac{r_d}{m}\right)^{mn}-1}{r_d/m}\right] - \sum_{t=0}^{mn} CO_0\left(1+\frac{r_d}{m}\right)^{mn-t} \quad 2.2$$

Application for both mixed stream cash flows and even cash flows and where cash inflows occur at the beginning of the period.

$$NFV=\sum_{t=1}^{mn} CI_t\left(1+\frac{r_d}{m}\right)^{mn+1-t} - \sum_{t=0}^{mn} CO_0\left(1+\frac{r_d}{m}\right)^{mn-t} \quad 2.3$$

Application for even cash flows only and where cash inflows are annuity due

$$NFV=CI_e\left[\frac{\left(1+\frac{r_d}{m}\right)^{mn}-1}{r_d/m}\right]\left(1+\frac{r_d}{m}\right) - \sum_{t=0}^{mn} CO_0\left(1+\frac{r_d}{m}\right)^{mn-t} \quad 2.4$$

2.3 MEANING OF THE ABOVE EQUATION'S VARIABLES

Cl_e = Equal cash inflow or equal payment

Cl_0 = Cash out flow at time period zero or today

m= Number of frequency

n= Number of year

Cl_t = Cash inflow at time period t

CO_t= Cash outflow at time period t

r_d = Discount and compound rate

mn = Total period

3 RESULTS

3.1 BEHAVIOUR OF NPV

The Researcher found that the NPV declined as to being increased discount rate. In this study, researcher applied the different percentages which are presented in table 1.1 and got different values of NPV. The study showed the negative relationship between discount rate and NPV value.

3.2 BEHAVIOUR OF NFV

For investing and or lending project, the researcher found that the NFV declined as to being increased compound rate but for borrowing perspective, NFV increased or declined negatively as to being increased compound rate.

3.3 RELATIONSHIP

For calculating the NFV both for borrowing perspective and investment or lending perspective, researcher used different compound rates and got different values for both case, that are presented in table 1. NPV has positive relationship with NFV for investing/ lending perspective but negative relationship for borrowing perspective. The results of the table 1 of NPV and NFV were gotten by using equation 3.1 for NPV, 1.4 for NFV in borrowing perspective and 2.4 for NFV in investment and or lending perspective. To get the idea swiftly captivate, these tabulated results of these techniques (NPV and NFVs) were presented in the graphical form.

Table 1. Value of NPV and NFV and Their Relationship.

Percentage	NPV (Taka)	NFV for Investing (Taka)	NFV for Borrowing (Taka)
1%	976084.88	988594.771	-988594.771
2%	895762.38	917748.81	-917748.81
3%	816542.57	844949.508	-844949.508
4%	738407.76	770155.402	-770155.402
5%	661340.55	693324.241	-693324.241
6%	585323.88	614412.974	-614412.974
7%	510340.97	533377.735	-533377.735
8%	436375.35	450173.828	-450173.828
9%	363410.88	364755.713	-364755.713
10%	291431.53	277076.992	-277076.992
11%	220421.81	187090.394	-187090.394
12%	150366.33	94747.7567	-94747.7567
13%	81250.01	0.01598039	-0.01598039
14%	13058.06	-97202.813	97202.813

Source: *Author*

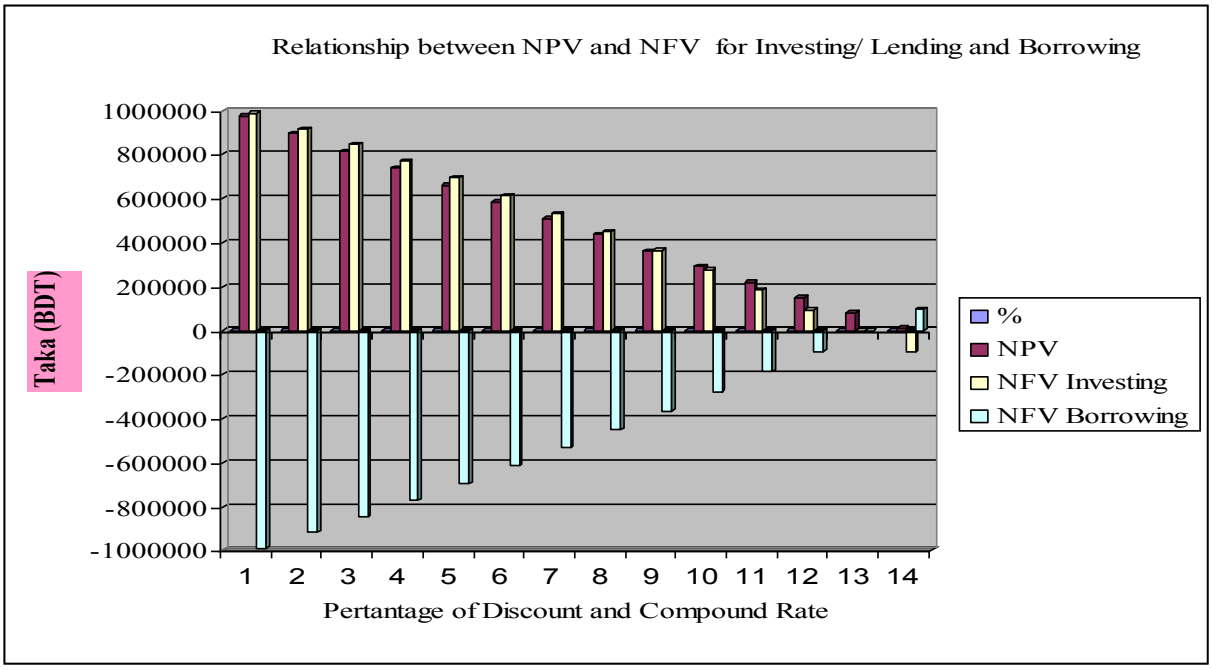

Fig.1. Relationship between NPV and NFV for Investing/ Lending and Borrowing.

Figure 1 represents the results of the table 1 with discount rates and compound rates. These rates were presented in the horizontal axis of graph and findings of NPV and NFVs in the vertical axis. This figure ultimately flourishes the positive relationship between NPV and NFV in case of investing or lending project or investor or lender perspective as both of their values with the given percentages lies above origin point 0 corresponding of horizontal axis but negative relationship between NPV and NFV for borrowing project or borrower or debtor perspective as NFV values with given percentages lie below origin point 0 corresponding of horizontal axis.

4 DISCUSSION

4.1 APPLICATION OF NFV

The researcher applied his invented NFV techniques on the bank loan and its installment. The meaning of letters used in the equation (s) have been provided in materials and methods section. The researcher viewed that the bank's loan or lending amount was cash out flow for the bank and installments provided by the borrower were cash inflows for bank. In this phenomenon, the researcher studied on an account holder's loan provided by the Prime bank limited, Dinajpur branch, Dinajpur, Bangladesh. The researcher applied equation 2.4 as it being investor or lender perspective. M/S Blue Bell Auto Rice Mill, Proprietor, Mr Blue, borrow on Dec.27, 2008, tk7500000 at 13% interest rate on 12 installment paid per year for two year loan period from the Prime Bank Limited. The amount of payment per installment was charged for Tk. 356563.67 and the numbers of installments were 24 due to monthly frequency being considered. Table 2 represents these installment figures.

Table 2. Installment Amount of Loan Supplied

Payment Date	Installment (Taka)	Payment Date	Installment (Taka)	Payment Date	Installment (Taka)
12/27/08	356563.67	8/27/09	356563.67	4/27/10	356563.67
1/27/09	356563.67	9/27/09	356563.67	5/27/10	356563.67
2/27/09	356563.67	10/27/09	356563.67	6/27/10	356563.67
3/27/09	356563.67	11/27/09	356563.67	7/27/10	356563.67
4/27/09	356563.67	12/27/09	356563.67	8/27/10	356563.67
5/27/09	356563.67	1/27/10	356563.67	9/27/10	356563.67
6/27/09	356563.67	2/27/10	356563.67	10/27/10	356563.67
7/27/09	356563.67	3/27/10	356563.67	11/27/10	356563.67

***Source**: Prime Bank Limited, Dinajpur Branch, Dinajpur, Bangladesh.*

4.2 INVESTMENT OR LENDING PERSPECTIVE

Inflation rate in Bangladesh averaged 6.65 percent from 1994 until 2014 [16]. Researcher used this average inflation rate as the compound rate to find the NFV on above lending amount. In this case, researcher can have the future value using the equation 2.4 presented in the materials and methods section. By using that equation, researcher has had the value calculated as follows-

$$NFV = CI_e\left[\frac{\left(1+\frac{r_d}{m}\right)^{mn}-1}{r_d/m}\right]\left(1+\frac{r_d}{m}\right) - \sum_{t=0}^{mn} CO_0\left(1+\frac{r_d}{m}\right)^{mn-t}$$

$$= \text{Tk. } 356563.67\left[\frac{\left(1+\frac{.0665}{12}\right)^{12\times 2}-1}{.0665/12}\right]\left(1+\frac{.0665}{12}\right) - \text{Tk. } 75000000\left(1+\frac{.0665}{12}\right)^{12\times 2-0}$$

= Tk. 9125714.56- Tk. 8563730.

= Tk. 561984.45

By applying this equation in same way, considering different compound rates, it is got the NFVs presented in the table 1. NFVs show the decreasing values with increasing compound rates.

4.3 BORROWING PERSPECTIVE

Researcher was so much interested for the application equation 1.4 in borrowing concept. Actually this equation of NFV is the opposite to the equation 2.4 of NFV. Applying the same compound rate, researcher has gotten the NFV negative where in earlier case it was found positive.

$$NFV = \sum_{t=0}^{mn} CI_0\left(1+\frac{r_d}{m}\right)^{mn-t} - CO_e\left[\frac{\left(1+\frac{r_d}{m}\right)^{mn}-1}{r_d/m}\right]\left(1+\frac{r_d}{m}\right)$$

$$= \text{Tk. } 75000000\left(1+\frac{.0665}{12}\right)^{12\text{ x }2-0} - \text{Tk. } 356563.67\left[\frac{\left(1+\frac{.0665}{12}\right)^{12\text{ x }2}-1}{.0665/12}\right]\left(1+\frac{.0665}{12}\right)$$

= Tk. 8563730.11- Tk. 9125714.56

= -Tk. 561984.45

By applying this equation in same way, considering different compound rates, it is gotten the NFVs presented in the table 1. NFVs show the increasing values with increasing compound rates.

4.4 NPV AND NFV FOR INVESTING PROJECT AND BORROWING PROJECT

Researcher applied the average inflation rate as the discount rate to calculate the NPV and found out the relationship between NPV and NFV.

$$NPV = CI_e\left[\frac{1-\left(1+\frac{r_d}{m}\right)^{-mn}}{r_d/m}\right]\left(1+\frac{r_d}{m}\right) - \sum_{t=0}^{mn} CO_0\left(1+\frac{r_d}{m}\right)^{-t} \quad 3.1$$

$$NPV = \text{Tk. } 356563.67\left[\frac{1-\left(1+\frac{.0665}{12}\right)^{-12\text{ x }2}}{.0665/12}\right]\left(1+\frac{.0665}{12}\right) - \text{Tk. } 7500000\left(1+\frac{.0665}{12}\right)^{-0}$$

= Tk. 8036468.43 - Tk. 7500000

= Tk. 536468.434

Using this equation in same way, considering different compound rates, it is gotten the NPVs presented in the table 1. NFVs show the decreasing values with increasing discount rates.

5 CONCLUSION

In this study, author has identified the new capital budgeting technique named NFV. To find the NFV, compound rates have been used, that rates compounded cash inflows and cash outflows and then deviations have been found out between compounded cash inflows and compounded cash out flows. The study also shows the relationship between NFV and NPV, where it has gotten that NPV has positive relationship with NFV for the investor/ lender perspective but negative relationship for borrower perspective. The Positive NFV creates positive worth and the negative NFV creates the negative worth. NPV rule produces discounted behavior but NFV principles create compounded behavior. The 0 value which is found when both compounded cash inflows and compounded cash outflows are equal. So, NFV techniques exposes the neutrality due to be had 0 value as NPV technique of capital budgeting shows impartiality due to the discounted cash inflows and discounted cash outflows being equal or having 0 value.

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