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**THIS WAY OR THAT WAY – A RE-LOOK AT SOME POPULAR
FORMULAE IN FINANCE AND COSTING**

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Abstract

A formula after all is a formula. Is the available formula, the only way to reach the solution? If not, what is the alternative available? And in case, there is an alternative available, why is that we are hooked to only one formula? This article tries to explore alternative formulae available to a couple of popular ones – the NPV and the standard costing formula. An attempt has also been made to understand the reasons for the preference for one over the other.

Keywords: Alternative Formula, Formula, NPV, NFV, Standard Costing Formula

Introduction

Ever wondered if there is another way similar to NPV for evaluating capital budgeting proposal? Or can we use some alternate formulae to find out cost variance? This article is an attempt to study the “twin-like” approaches that are available for some popular calculation methods in

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finance and also to understand, wherever possible, the reasons for the preference for one approach over the other.

Whenever I try to discuss this whole idea with people, their usual reaction is that they are formulae and there is no challenge to formulae. They are the way they are and they are the only ways to reach the solution. I somehow do not get convinced and hence I want to discuss and debate this.

Case 1 = NPV or NFV

Let's start with NPV (Net Present Value). We can use as an alternative approach the NFV (Net Future Value) for evaluating capital budgeting proposals. Whether we use NPV or NFV, we get the same ultimate result. While NPV uses discounting, NFV uses the opposite, compounding. Yet the ultimate results are the same as is demonstrated through Illustration 1 given below: -

Illustration 1 –

Year	CF	PV Factor	PV	FV Factor	FV
0	-40000	1.00	-40000	1.21	-48400
1	50000	0.91	45455	1.10	55000
2	10000	0.83	8264	1.00	10000
		NPV	13719	NFV	16600
		~ NFV	16600	~ NPV	13719

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Discounting / Compounding Factor used – 13%

CF – Cash Flow, PV – Present Value, FV – Future Value

NPV – Net Present Value, NFV – Net Future Value

~ NFV - Equivalent Net Future Value of NPV, ~ NPV - Equivalent Net Present Value of NFV

In the above illustration, NFV equivalent of NPV 13719 is 16600 (13719×1.21) or NPV equivalent of NFV 16600 is 13719 (16600×0.83). Apparently the result in terms of NPV and NFV might look different, but this difference is only of form and not of substance. When they are adjusted for the timing differences one can understand that either through NPV or NFV we actually mean one and the same thing.

In fact, the next illustration will demonstrate an interesting case where NPV and NFV are equal even on the face of the calculation itself.

Illustration 2 –

Year	CF	PV Factor	PV	FV Factor	FV
0	-100000	1.00	-100000	1.10	-110000
1	110000	0.91	100000	1.00	110000
		NPV	0	NFV	0

In the above example NPV is equal to NFV even prior to the adjustment of the timing difference. The reason for this equality between NPV and NFV is the fact that the discounting or

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compounding rate is the Internal Rate of Return (10%, in this case) and we know that IRR in fact means that rate of return where NPV is zero. This applies to NFV as well.

With this discussion on the similarity of NPV and NFV, I have the following question –

Why despite similar results, we have a preference for NPV? Why not NFV?

Whether you refer to the likes of Van Horne¹ or Dr.Prasanna Chandra² you would find that most of the authors use NPV and not NFV. I always wonder, what must be the reason for the preference of NPV over NFV despite the two yielding the same results.

One reason that I can think of is perhaps since we do the calculations at $t = 0$, it is better to have all the future values expressed at their equivalents at $t = 0$, that is, the present values. But mind you even if we are doing the calculations at $t = 0$, the calculations are usually done for the future cash flows.

There is no doubt that conceptually, NPV or NFV are the same. Actually, they are not two distinct methods as such, it is only the way we are looking at it, that decides whether we would be using discounting or compounding. But if we think, from a layman's perspective, do you think he would be more comfortable with discounting or compounding? Are ordinary people more comfortable with the idea of multiplication (compounding) or division (discounting)? Math, in any case, is a subject liked by only a few! Given a choice between more difficult math and a slightly lesser difficult math, why not choose the latter?

Case 2 – Standard Costing formulae

Next we turn to another such case with the formulae used in standard costing for calculation of variances. Let me illustrate the point with one example.

Illustration 3 -

Given SP = 10, AP = 15, SQ = 5000 & AQ = 6000.

- a. Calculation of Material Cost Variance using one set of formulae –

$$\text{Material Price Variance} = (\text{SP} - \text{AP}) \times \text{AQ} = (10 - 15) \times 6000 = 30000 \text{ (A)}$$

$$\text{Material Usage Variance} = (\text{SQ} - \text{AQ}) \times \text{SP} = (5000 - 6000) \times 10 = 10000 \text{ (A)}$$

$$\text{Material Cost Variance} = 30000 \text{ (A)} + 10000 \text{ (A)} = 40000 \text{ (A)}$$

- b. Calculation of Material Cost Variance using another set of formulae –

$$\text{Material Price Variance} = (\text{SP} - \text{AP}) \times \text{SQ} = (10 - 15) \times 5000 = 25000 \text{ (A)}$$

$$\text{Material Usage Variance} = (\text{SQ} - \text{AQ}) \times \text{AP} = (5000 - 6000) \times 15 = 15000 \text{ (A)}$$

$$\text{Material Cost Variance} = 25000 \text{ (A)} + 15000 \text{ (A)} = 40000 \text{ (A)}$$

SP = Standard Price, AP = Actual Price

SQ = Standard Quantity, AQ = Actual Quantity

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When we refer to popular books^{3,4} you would invariably come across the first set of formulae that is used for calculation of variances. You can test for the similarity of the ultimate result using either set of the formulae by applying them to any number of examples.

Let us test the popular set of formulae for the logic through a rather unusual illustration. The example formulated has been deliberately chosen so since we are trying to test the formulae.

Illustration 4 –

Standard Price for a material was set to be 10 and standard quantity was fixed as 100, thus the standard cost was determined to be 1000. The purchase manager did the best of negotiations and made the supplier agree to supply at 5 per unit. Due to some development, the order actually had to be cancelled and there were no supplies or the actual quantity purchased was zero. The Cost Accountant calculated the variances as under –

$$\text{Material Price Variance} = (\text{SP} - \text{AP}) \times \text{AQ} = (10 - 5) \times 0 = 0$$

$$\text{Material Usage Variance} = (\text{SQ} - \text{AQ}) \times \text{SP} = (100 - 0) \times 10 = 1000 \text{ (F)}$$

$$\text{Material Cost Variance} = 0 + 1000 \text{ (F)} = 1000 \text{ (F)}$$

The Purchase Manager went furious for the 0 credit given to him despite his hard negotiation and more so for the 100% credit given to the Production Manager for the favorable variance. He suggested that the Cost Accountant should calculate the variances using another set of formulae. In fact he presented the following calculation of the variances -

$$\text{Material Price Variance} = (\text{SP} - \text{AP}) \times \text{SQ} = (10 - 5) \times 100 = 500 \text{ (F)}$$

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$$\text{Material Usage Variance} = (\text{SQ} - \text{AQ}) \times \text{AP} = (100 - 0) \times 5 = 500 \text{ (F)}$$

$$\text{Material Cost Variance} = 500 \text{ (F)} + 500 \text{ (F)} = 1000 \text{ (F)}$$

Don't you see some merit in the point the Purchase Manager is trying to make through his set of formulae? Or sticking to the first set of formulae, do we want to discourage him by saying that his efforts are meaningless unless and until there are purchases?

What I understand from this and other examples of standard costing is as under –

1. The two formulae (that of price variance and usage variance) cannot be viewed as independent of each other or stand-alone types. If, for instance, we have a case where the standard quantity and actual quantity is the same, only then the material price variance would be a “pure price variance.” The moment this is not the case, this purity is lost. This point can be better explained through the following illustration –

Illustration 5 -

Given SP = 10, AP = 5, SQ = 100 & AQ = 200.

Calculation of Material Cost Variance using the popular set of formulae –

$$\text{Material Price Variance} = (\text{SP} - \text{AP}) \times \text{AQ} = (10 - 5) \times 200 = 1000 \text{ (F)}$$

$$\text{Material Usage Variance} = (\text{SQ} - \text{AQ}) \times \text{SP} = (100 - 200) \times 10 = 1000 \text{ (A)}$$

$$\text{Material Cost Variance} = 1000 \text{ (F)} + 1000 \text{ (A)} = 0$$

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SP = Standard Price, AP = Actual Price

SQ = Standard Quantity, AQ = Actual Quantity

Here when we calculate and report 1000(F) variance as material price variance, don't you find that the Purchase Manager is getting some undue credit because of the poor performance of the Production Manager! In other words, don't you think that the performance of the Purchase Manager is rather magnified because of the inefficiency of the Production Manager.

2. Both of them when used together do lead to a correct calculation of the total cost variance.
3. Which is why, it should not make much difference whether we use standard quantity instead of actual quantity for calculation of price variance and simultaneously when we use actual price instead of standard price for calculation of usage variance.

If that is the case then my question is –

Why the preference only for the first set of formulae? Why not the second one?

Any answers? Readers are requested to share their views.

Conclusion

Let us not conclude that the popular approaches or formulae are the only ways of finding out solutions to problems. There are and there can be alternative approaches leading to the same results. What is important for us is to keep our minds open. Let's give up this rigidity in our

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thoughts that we develop by getting hooked to one particular formula as if it is the only way to reach the solution. It is only when we are flexible we would be in a position to develop a more clearer understanding of the concepts instead of ending up in just mugging up the formulae.

References

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