Resort to Adjusted Present Value *(Outlook of a Practitioner)*

Discounted Cash Flow (DCF) based models are widely used while evaluating viability/ feasibility of capital investment proposals. Academicians normally promote the conceptually superior Net Present Value (NPV) rule, while a number of practicing managers still resort to the Internal Rate of Return (IRR) & Discounted Pay-Back (DPB) techniques for evaluating capital investment options despite the conceptual limitations inherent in such techniques. The Adjusted Present Value (APV) technique is yet another DCF model which may be effectively used for appraising capital investments. Although, conceptually, APV is an extension of the NPV rule, it proves to be a useful device in the hands of practicing managers essentially because, it manages to address the key issue of financing side effects inherent in most capital investment proposals in an effective manner. This article explains the APV concept and with the aid of a standard number-crunching exercise (extracted from CA Final question bank), clarifies the reasons as to why this technique may be preferred while taking CAPEX decisions, giving due consideration to certain practical realities encompassing capital investment proposals.

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Introduction

It is a well recognised and well established fact that DCF based models are regarded as ideally suited models while evaluating capital investment/project appraisal decisions. The DCF tools normally in use includes (amongst others) the NPV, IRR, DPB, Profitability Index (PI) and the Modified Internal Rate of Return (MIRR) techniques. Academicians, the world over invariably stresses on NPV as the most preferred model for project appraisal decisions essentially because it is regarded as conceptually and logically sound. However, practitioners often resort to the IRR and DPB

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rules for decision making purposes despite the fact that academicians repeatedly advise them against these techniques because of certain conceptual limitations which are inherent in such IRR & DPB modelling. However, the conceptual limitations inherent in the IRR and DPB rules had actually not encouraged the practitioners to shy away from these methods of appraisal altogether. Practitioners often resort to IRR and DPB techniques while selecting investment options as much as they use the theoretically superior NPV model essentially due to their intuitive appeal. Such a phenomenon (i.e. practitioner's preference for the IRR and DPB methods despite its academic limitations) may possibly be appreciated once we "wake up" to a few practical (rather ground realities) encompassing project appraisal decisions. In other words, the DPB & IRR methods of investment appraisal enjoy certain obvious "practical advantages" over the "academically superior" NPV model of decision making. Therefore, prudent practicing managers are reluctant to shelve the IRR and DPB concepts altogether and hence, these methods of investment appraisal would continue to be used predominantly in the industry despite their "conceptual limitations". The Adjusted Present Value (APV) rule is yet another DCF model which may be effectively applied while appraising capital investments. Although, conceptually, APV is an extension of the NPV rule, it is characterised by certain inherent practical advantages due to which it enjoys a reasonable degree of popularity in the industry so far as practicing finance managers are concerned. The enclosed article explains the framework of the APV model and attempts to highlight the specific merits of this method of project appraisal that had culminated in the continued popularity of this model in the industry. This article essentially focuses on "practitioner's outlook" and attempts to clarify the utility of the APV model promoting its "practical use". This article makes use of a standardised number crunching exercise for clarifying the concept of APV coupled with its inherent practical advantages. This standardised number crunching exercise had actually been extracted from the CA Final question bank and it may also be noted that this particular exercise (with minor variations/ alterations here and there) had actually appeared more that once in the CA Final Examination Papers.

Adjusted Present Value (APV) – The Model

Conceptually, APV is an extension of the NPV rule and hence, the decision matrix propounded by APV model is identically same as that of NPV. In other words, while using APV as the appraisal criterion for evaluating capital investment options, investments fetching positive APV should ideally be selected and investment options fetching negative APV need to be rejected. The APV of a capital investment is captured with the aid of the following formulation,

APV = Base Case NPV + PV of Financial Side Effects.

Herein, we need to look at the conceptual understanding that pertains to "Base Case NPV". Conceptually, "Base Case NPV" of the capital investment option under review refers to the NPV that is expected to be generated by the investment option in case such capital investment had been financed by equity only. Therefore, while computing the "Base Case NPV", the cost of equity (capturing the relevant risk exposure attributable to the specific capital project under review) is naturally regarded as the appropriate hurdle rate for discounting the project cash flows. However, it goes without saying that the financing mix of most capital projects of a reasonable size comprises both debt and equity. Now, the component of debt financing in the capital structure (despite having an impact on the risk exposure of the project due to the leverage factor) would provide some additional benefits to the party undertaking the project — the most standard example being the benefits generated in the form of "tax shields on interest payments" pursuant to the debt financing component. Such tax shields would get reflected in the project cash flows and hence, such additional benefits would enhance the overall worth of the capital project. Such benefits have been captured by the phrase "Financing Side Effects" in the above formulation although it may be noted here that the "Financing Side Effects" component may not be restricted to interest tax shield benefits only. Now, these benefits which are generated in the form of "Financing Side Effects" across the useful life of the project under review are discounted to their present values applying an appropriate and suitable hurdle rate and the "Present Value of Financing Side Effects" is obtained. Such benefits are simply added to the "Base Case NPV" (computed earlier) and the APV of the

project is arrived at. To summarise – while evaluating a Capital Project "X" if the "Base Case NPV" works out to "A" and the "Present Value of Financing Side Effects" amount to "B", the APV of Project "X" is given by "A + B" and if such APV depicts a positive number, Project "X" ought to be accepted. We would now operate the above concept in respect of a standardised number crunching exercise extracted from the CA Final question bank (given below) and attempt to establish the conceptual supremacy of the APV model highlighting (rather clarifying) the inherent practical advantages that this particular model enjoys. We guess that the following discussion would encourage practicing managers to resort to APV model while evaluating capital projects.

The Number Crunching Exercise

A new company is planning to set up a plant in district "X" (which is a backward district) at a cost of ₹3 crore. Locating the plant in district "X" would attract a non-refundable cash subsidy of ₹30 lakh from the Central Government. In addition to this benefit, taxable profits to the extent of 20% would be exempted from taxes for a period of 10 years if the plant were to be located in district "X". The above project envisages a borrowing of ₹2 crore and the cost of borrowing would be 10% only if the project is located in district "X" (it may be noted that, the borrowing cost would be much higher than 10% in case the project is located in developed urban areas). This particular capital project would have a useful life of 10 years with zero salvage value. However, locating the plant in district "X" would attract higher operating costs, which would naturally culminate in lower EBDIT (as compared to that of other developed urban locations). The borrowings need to be repaid in four equal annual installments beginning from the end of fourth year. In order to evaluate capital investments of these types, the company uses a hurdle rate of 15% for NPV computation and the applicable tax rate of the company is 50%. Assuming that straight line depreciation policy is allowed (in this case) by Income Tax Authorities while computing taxable profits, you are required to compute the NPV of this project and advise the company as to whether it would be worthwhile to locate the new plant in district "X". The tabulated information (given in the next page titled Exhibit I) provides the EBDIT that would be generated across the useful life of the project along with the year-wise discounting factors at the applicable hurdle rate of 15%.

Practitioners often resort to IRR and DPB techniques while selecting investment options as much as they use the theoretically superior NPV model essentially due to their intuitive appeal.

Exhibit I

Years	Estimated EBDIT(₹ lakhs)	Discounting factors at 15%
1	(50)	0.87
2	(20)	0.76
3	10	0.66
4	20	0.57
5	50	0.50
6	100	0.43
7	150	0.38
8	200	0.33
9	225	0.28
10	350	0.25

Note

Figures within brackets denote negative figures and the discounting factors (as given in the above table) had been rounded off to two places of decimals only.

Operating The NPV Rule To The Given Exercise

First, we operate the NPV rule to develop a solution to the given number crunching exercise. Incidentally, a similar solution also appears in the "suggested answers" issued by the Institute of Chartered Accountants of India. The NPV solution is tabulated below in form of Exhibit II.

Abbreviations Used

Dep = "Depreciation", Int = "Interest Charges", C/I = "Cash Inflows", C/O = "Cash Outflows", Net C/F = "Net Cash Flows" and PV = "Present Value".

Exhibit II (All Figures in Rupees Lakhs)

Years	0	1	2	3	4	5	6	7	8	9	10
EBDIT		(50)	(20)	10	20	50	100	150	200	225	350
(Dep)		(27)	(27)	(27)	(27)	(27)	(27)	(27)	(27)	(27)	(27)
(Int)		(20)	(20)	(20)	(20)	(15)	(10)	(5)	0	0	0
PBT		(97)	(67)	(37)	(27)	8	63	118	173	198	323
(Tax)		0	0	0	0	0	0	0	(54)	(79)	(129)
PAT		(97)	(67)	(37)	(27)	8	63	118	119	119	194
C/I		(70)	(40)	(10)	0	35	90	145	146	146	221
C/O	(70)	0	0	0	(50)	(50)	(50)	(50)	0	0	0
Net C/F	(70)	(70)	(40)	(10)	(50)	(15)	40	95	146	146	221
DF 15%	1.00	0.87	0.76	0.66	0.57	0.50	0.43	0.38	0.33	0.28	0.25
PV	(70)	(61)	(30)	(7)	(29)	(8)	17	36	48	41	55

Based on Exhibit II, the NPV of the Project under review (computed by taking a total of the PV row as computed) works out to "8 Lakh (Negative)" and hence, the same needs to be rejected.

The relevant information/assumptions/logic applied while constructing Exhibit II is given below for ready reference:

a) Figures within brackets indicate negative numbers and all figures had been rounded off to the nearest lakh.
b) As ₹30 lakh of the overall project cost of ₹3 crore had been provided by the Central Government in the form of non-refundable cash subsidy, it has been logically assumed that the company may only claim the straight line depreciation benefit on ₹2.70 crore i.e. after adjusting the non-refundable cash subsidy component.
c) Interest charges of 10% had been considered on the loan component and the same had been accordingly adjusted over the useful life of the project giving due consideration to the principal repayment schedule of such loan which had been made effective from the end of fourth year of the useful life of the project in line with the case facts.
d) While computing the tax component, set off/carry forward of losses had been considered as per applicable tax regulations and taxable profits to the tune of 20% had also been considered as exempted from taxes in line with the case facts.
e) The Cash Inflows had been computed applying the formula "Profit After Tax PLUS Depreciation (PAT + Dep)"
f) The cash outflows in year zero comprise the "out of pocket" initial investment after adjusting the cash subsidy component provided by the Central Government.
g) The principal repayment schedule of the loan begins from the end of fourth year (as per the case information) and the same would be required to be paid in four equal annual installments. Such principal repayment of loan had been factored in the computations given in Exhibit II in form of "Cash Outflows".
h) The "Net Cash Flows" had been computed as the difference between "Cash Inflows" and "Cash Outflows". Naturally, "Net Cash Flows" within bracket indicate "Net Cash Outflows" while "Net Cash Flows" without bracket indicate "Net Cash Inflows".
i) The "Net Cash Flows" had been discounted applying a suitable and appropriate hurdle rate of 15% (in line with the case facts) and the "Present Values of Net Cash Flows" had been arrived at.
j) The summation of "Present Values of Net Cash Flows" (as computed) provides the NPV number of "₹8 lakh (Negative)". As the project under review fetches "Negative NPV", the project needs to be rejected.

The Adjusted Present Value (APV) rule is yet another DCF model which may be effectively applied while appraising capital investments.

Criticism of The NPV Solution To The Exercise

The NPV solution to the case provided above is characterised by few limitations as explained hereunder.

First, Exhibit II reflects that the "Net Cash Flows" from the project under review is actually "negative" during the first five years of the useful life. The question that would naturally crop up is how would such negative cash flow phenomenon be handled? In other words, who would finance these "initial cash losses" that the project is expected to generate during the first five operating years? Usually, these are financed by the promoters of the capital project and in majority of cases their additional financial assistances are provided in form of "unsecured loans". Now, such a treatment of unsecured loans must be factored in the project appraisal model if we wish to arrive at a reasonable estimate of the NPV number.

Second, it may be noted that the "Net Cash Flows" had been discounted by a hurdle rate of 15% over the entire useful life of the project in order to obtain the "Present Values". Now the question that needs to be asked is — conceptually, what is this hurdle rate of 15%? Presumably, it should be the cost of equity of the project because the "Net Cash Flow" number as computed in Exhibit II effectively captures the cash flows available to equity financiers. Now, even if we go with the assumption that 15% rate is actually a suitable and appropriate estimation of the hurdle rate attributable to the pool of equity financiers giving due considerations to the overall risk exposure of the project, the question that still needs to be addressed is – would it be conceptually correct and practically wise to apply a single hurdle rate for discounting all project cash flows generated across the entire useful life of the project? It may be noted that the debt-equity mix attributable to the capital structure of the project

is dramatically changing over the years essentially because the leverage factor is gradually reducing pursuant to repayment of borrowings. Now, once the debt-equity mix changes, the financial risk exposure of the project reduces simultaneously and hence, such a phenomenon would affect the expectation of the equity financiers as well. After all, such capital projects do not really operate in hypothetic perfect market condition and therefore, the impact of changing capital structure on the "minimum expected rate of return" of the equity investors may not be ignored altogether. Thus, the cost of equity attributable to the project is expected to change as well and hence, it may not be conceptually sound to apply a single hurdle rate of 15% (uniformly) while discounting all project cash flows. Ideally, this should prompt a practicing finance manager to apply different hurdle rates for different years. Any finance manager would try to be doubly sure that the final number on the basis of which she/he is taking the decision had been estimated reasonably and hence, an ambitious practitioner may still make an attempt to factor in such changing hurdle rates in her/his computation exercise. It goes without saying that such an attempt would complicate the exercise "many fold" especially because of various subjective considerations inherent in such hurdle rate estimations.

Operating The APV Concept To The Same Case

Now, we make an attempt to offer another solution to the same case based on the APV model that we had introduced earlier in this article. As we are now aware, the first step is to compute the "Base Case NPV" tabulated in form of Exhibit III (given below).

Abbreviations Used
Dep = "Depreciation", Int = "Interest Charges", OCI = "Operating Cash Inflows", OI = "Other Inflows", C/O = "Cash Outflows", Net C/F = "Net Cash Flows" AND PV = "Present Value".

Exhibit III (All Figures In Rupees Lakhs)

Years	0	1	2	3	4	5	6	7	8	9	10
EBDIT		(50)	(20)	10	20	50	100	150	200	225	350
(Dep)		(27)	(27)	(27)	(27)	(27)	(27)	(27)	(27)	(27)	(27)
(Int)		0	0	0	0	0	0	0	0	0	0
PBT		(77)	(47)	(17)	(7)	23	73	123	177	198	323
(Tax)		0	0	0	0	0	0	(28)	(71)	(79)	(129)
PAT		(77)	(47)	(17)	(7)	23	73	95	106	119	194
OCI		(50)	(20)	10	20	50	100	122	133	146	221
OI		50	20	0	0	0	0	0	0	0	0
C/O	(270)	0	0	(10)	(20)	(40)	0	0	0	0	0
Net C/F	(270)	0	0	0	0	10	100	122	133	146	221
DF 15%	1.00	0.87	0.76	0.66	0.57	0.50	0.43	0.38	0.33	0.28	0.25
PV	(270)	0	0	0	0	5	43	46	44	41	55

Based on Exhibit III, the "Base Case NPV" of the Project under review (computed by taking a total of the PV row as computed) works out to "₹36 Lakhs (Negative)" and the relevant information/assumptions/ logic applied while constructing Exhibit III is given as under for ready reference:

a) Figures within brackets indicate negative numbers and all figures had been rounded off to the nearest lakh.
b) As ₹30 lakh of the overall project cost of ₹3 crore had been provided by the Central Government in the form of non-refundable cash subsidy, it has been logically assumed that the company may only claim the straight line depreciation benefit on ₹2.70 crore i.e. after adjusting the non-refundable cash subsidy component.
c) Interest charges had been totally ignored because the "Base Case NPV" is computed with the assumption that the project is a "cent percent equity financed project".
d) While computing the tax component, set off/ carry forward of losses had been considered as per applicable tax regulations and taxable profits to the tune of 20% had also been considered as exempted from taxes in line with the case facts.
e) The "Operating Cash Inflows (OCI)" had been computed applying the formula "Profit After Tax PLUS Depreciation (PAT + Dep)".
f) The "Other Inflows (OI)" actually captures the "unsecured loans" provided by the promoters in order to counter the initial "cash losses" generated by the project. For simplicity sake we have assumed that such "unsecured loans" are free of interest and the same would be repaid at the first available opportunity i.e. when the project starts fetching positive operating cash flows.
g) The cash outflows in year zero comprise the "out of pocket" initial investment after adjusting the cash subsidy component provided by the Central Government. In "Base Case NPV" computation we assume that the project is "cent percent" equity financed and hence, ₹270 lakh initial investment had been considered.

Conceptually, APV is an extension of the NPV rule and hence, the decision matrix propounded by APV model is identically same as that of NPV.

h) The other aspects of cash outflows (which are appearing in years 3, 4 and 5 respectively) capture the repayments of unsecured loans (without interest) to the promoters at the first available opportunity.

i) The "Net Cash Flows" had been computed on the basis of "Operating Cash Inflows", "Other Inflows" and "Cash Outflows" as tabulated in Exhibit III.

j) The "Net Cash Flows" had been discounted applying a suitable and appropriate hurdle rate of 15% (namely, the cost of equity of the investment option capturing the specific risk exposure of the project under review) and the "Present Values of Net Cash Flows" had been arrived at.

k) The summation of "Present Values of Net Cash Flows" (as computed) provides the "Base Case NPV" number of "₹36 lakh (Negative)".

Once the "Base Case NPV" had been computed we shift our focus to capture the impact of "Present Values of Financing Side Effects", namely, the second important component of the APV formulation (discussed earlier). Now, as the project under review is actually financed partly by borrowings - one obvious component of such "financing side effects" comprises the present values of tax shields pursuant to payment of interest. The same may be computed as "Interest * The Effective Tax Rate" discounted to their respective present values applying an appropriate factor of discount. Herein we assume that the interest tax shield benefit is as risky as the interest payments generating such tax shields and hence, we apply the borrowing cost rate of 10% for discounting purposes. It may also be noted that considering the tax exemption benefit amounting to 20% of taxable profits provided to the project under review, the effective tax rate attributable to this project works out to 40% only (considering the general tax rate of 50% given in the case information). Moreover, it needs to be appreciated that due to "carry forward and set off of losses" phenomenon such tax shield benefit pursuant to interest payments would actually accrue to this project effectively in year 6 and year 7 (Kindly refer to Exhibit II for details). Now, the computation of such "present values of interest tax shield benefits" is provided in Exhibit IV (given in the next page). It may be noted (refer the workings provided in Exhibit IV) that, the present values of tax shield on payment of interest on borrowings amounts to a total of "₹23 lakh (Positive)". However, it needs to be remembered that (unlike this simple exercise), the benefits of "Financing Side Effects" is not necessarily limited (or restricted) to the interest tax shield benefits only. Although not apparent in the case under review, readers of this article may kindly take a note of the fact that "Financing Side Effects" benefits may accrue to capital projects in many different forms as well.

While computing the "Base Case NPV", the cost of equity (capturing the relevant risk exposure attributable to the specific capital project under review) is naturally regarded as the appropriate hurdle rate for discounting the project cash flows.

Exhibit IV (Figures Rounded-Off to Nearest Lakh)

Year	Interest Payment	Tax Shield @ 40%	Hurdle Rate of 10%		Present Values
			Year	DF @ 10%	
1	20	8	6th	0.56	4
2	20	8	6th	0.56	4
3	20	8	6th	0.56	4
4	20	8	6th	0.56	4
5	15	6	6th	0.56	3
6	10	4	6th	0.56	2
7	5	2	7th	0.51	1
TOTAL					23

To summarise,

a) The "Base Case NPV" amounts to ₹36 lakh (Negative).

b) The "Present Value of Financing Side Effects" amount to ₹23 lakh (Positive).

c) Therefore, APV of the Project works out to ₹13 lakh (Negative).

As the APV of the project under review is negative the capital investment proposal needs to be rejected altogether.

Intuitive Appeal of The APV Model

The readers must have noted that the final management decision regarding acceptance/rejection of the capital investment proposal is actually the same in the instant case irrespective as to whether the NPV model or the APV model had been applied for decision making purposes. However, it needs to be recognised and appreciated that the APV model (as operated above) fetches a more reliable number of "₹13 lakh (negative)" as compared to the final number of "₹8 lakh (negative)" obtained by applying the NPV rule indiscriminately. A look at the reasons (listed below)

would clarify the intuitive appeal of the APV model for decision making purposes so far practicing finance managers are concerned. Essentially, due to the following set of reasons, practicing finance managers may be advised to resort to the APV model while evaluating capital investment proposals.

a) (As explained earlier) the extent of accuracy obtained while computing the actual worth of the capital investment proposal is more under APV modeling.
b) This model aids in visualising capital investment proposals in a very effective manner. First it captures the viability of the proposal in terms of an all equity financing option, namely, captured in the form of "Base Case NPV".
c) The enhancement in the worth of the proposal pursuant to financing strategies are then captured separately in form of the "Financing Side Effects" which are added on to the "Base Case NPV" in order to arrive at the final true worth of the capital investment proposal.
d) The overall quality of management information that is generated in APV modeling is of a superior quality as the cash flows and specific benefits accruing to the project are suitably categorised, segregated and then reported separately.
e) The serious practical problem of adjusting the year-wise hurdle rate (for discounting the cash flows) pursuant to regular changes in the debt-equity mix in the capital structure attributable to the project under review may be avoided altogether (as clarified in the above computations).
f) Finally and perhaps the most important reason is – APV Model is "Conceptually Sound".

It has been repeatedly observed in the industry that practicing managers often resort to IRR and Discounted Pay Back (DPB) methods of investment appraisal (despite the conceptual limitations inherent in such models) due to their intuitive appeal in view of various practical realities encompassing investment options in the business world. Now, it may be commented that the APV model also enjoys a number of practical advantages which promotes its use in practice. Over and above such practical advantages inherent in APV modeling this particular DCF based tool is conceptually sound as well. In view of the same the APV model may strongly be recommended while evaluating viability/feasibility of capital investments. However, in case our above discussion actually encourages practicing finance managers to resort to APV, they are also requested to take a note of the following important observations.

a) Theoretically speaking — financing side effects are not ignored in a standard NPV model. While evaluating investment decisions characterized by a debt-equity financing mix, we normally compute the cash flows attributable to the stakeholders (i.e. providers of both debt & equity finance) and then discount the estimated future cash flows by applying the weighted average cost of capital (WACC) as the hurdle rate. Now, once that approach is adopted, the financing side effects (namely, the interest tax shield benefits) are naturally captured in the WACC computation which recognises the concept of "after tax cost of debts". However, once the debt-equity mix in the capital structure undergoes frequent changes (as we had encountered in the instant case), it may have an impact on WACC and hence, it may not be conceptually correct to apply a uniform WACC as the hurdle rate for discounting the cash flows. In other words, the capital budgeting problem under review may demand the use of different hurdle rates for different years across the useful life of the project and this important aspect should logically be incorporated as an input variable in the NPV computation exercise.
b) It needs to be recognised (and appreciated) that effectiveness of any DCF based evaluation model is largely dependant on the reliability and quality of the input variables, namely, the quality of financial forecasts in relation to capital budgeting decisions (the APV model being no exception to this general rule). Therefore, application of the APV model does not undermine the importance and utility of a "risk analysis" exercise in capital budgeting decisions. Hence, even when practicing finance managers resort to APV model for decision making, such an exercise needs to be coupled with a thorough and in-depth risk analysis exercise (ideally characterised by risk visualisation and risk mitigation strategies) before arriving at a final decision.

Conclusion

In view of the above discussion the author strongly recommends the use of APV model in practice while appraising capital investments. The APV model is conceptually sound and enjoys certain practical advantages due to which practicing managers may find it ideally suited to operate while evaluating investment options. ■