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Re-examining project appraisal and control: developing a focus on wealth creation

Mehari Mekonnen Akalu

Tinbergen Institute, Erasmus University, Burg. Oudlaan 50, 3062 PA, Rotterdam, The Netherlands

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Abstract

Capital investment appraisal techniques based on discounted cash flow have been in use since the 1970s. However, in spite of their popularity, the link between the value projects assured by these techniques and the value attained by the organization is not certain. Thus, there is a growing interest in the search for appraisal techniques, which directly link project value to shareholder value. Therefore, it is a universal principle to base choices on alternative courses of action both at the investment stage of the project, and during project execution. This paper reviews the strengths and weaknesses associated with traditional investment appraisal techniques and their effect on shareholder value. It also explores the prospects of shareholder value analysis as a candidate for the future investment evaluation and monitoring.

Keywords: Project appraisal; Project control; Shareholder value; Investment appraisal techniques; Discounted cash flow (DCF)

1. Introduction

Projects can be initiated at all levels of an organization. For the purpose of checking their feasibility and their adherence to the goals of the firm, projects need to be appraised, before they start, using project appraisal techniques. These appraisal methods are variously called project selection models [28], or capital budgeting techniques [15].

Traditional project appraisal techniques include accounting-based measures and time-based discounted cash flows (DCFs). The former measures the apparent profitability while the latter measures the extent of net cash flows. However, neither measures wealth nor shareholder value creating, which is the objective of the modern firm. This paper reviews the potential effects of the shareholder value technique both to approve project selection, and continuously gauge their execution.

The paper begins by discussing traditional methods of capital investment appraisals, reviews their strengths and weaknesses, and the reasons why new developments are required with objectives of maintaining shareholder value. Recent developments in the capital investment appraisal are considered and current trends are reviewed. The weaknesses in current appraisal techniques, in line with the maximum wealth creation, will be discussed. The shareholder value analysis is introduced as potentially overcoming the above problems. The need for continuously appraising the project status against the requirement of wealth creation, is also visited vis-a-vis the method of shareholder value analysis.

2. Traditional methods

2.1. The non-DCF methods

Traditional non-DCF methods are perhaps, the first group of appraisal techniques applied in projects. They are simple to apply and interpret. The payback period (PBP) and the accounting/average rate of return (ARR) are commonly known under this category.

2.1.1. The payback period (PBP)

The PBP is the number of years required to recover the initial investment of the project. Hence, it emphasizes liquidity and the risk position of the project. The computation of PBP is simple if the cash flows are in the form of an annuity. A method of commutative cash

E-mail address: mekonnen@few.eur.nl (M.M. Akalu).

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flows is necessary in the case of a non-annuity pattern of cash flows. For the annuity pattern of cash flow, the PBP can be computed using the following relationship (see Ref. [28], p. 50)[1]:

$$\text{PBP} = \left[\frac{I}{\Pi}\right] \tag{1}$$

where PBP is the payback period (years), Π is the annual profit in annuity form, and I is the amount of investment.

Despite its simplicity, PBP has a number of drawbacks. The major criticism is that it does not take into account the time-value of money. Moreover, since it concerns with liquidity and not profitability, it does not account all cash flows occurring after the required number of years. However, it does provide a very useful initial safety mechanism for projects.

Discounted payback period (DPBP), proposed by Longmore [25], is a refinement made to tackle some of the problems of the payback method. This approach discounts the cash flow of the project and divides it into the initial investment as the simple PBP does. However, it still considers only those cash flows until the required year.

PBP is applied in a number of companies, for a range of projects, as one of the standard investment appraisal techniques. Reported research results indicate that 54 and 65% respectively of UK and US companies, extensively use the DPBP in their investment appraisals [21]. Moreover, Chadwell-Hatfield et al. [8], have found 65% of the 118 sampled US manufacturing firms utilizing the simple PBP as an important method in evaluating projects.

2.1.2. Accounting/average rate of return (ARR)

ARR is designed to compute the percentage of expected return on the project. It uses the accounting profit to measure benefits of the project. Hence, it conforms very closely with accounting records and reports of the project. Computation of ARR is possible using the following formula (see, for example, Ref. [15], p. 367)[2]:

$$\text{ARR} = \left[\sum_{i=1}^{T} \frac{\Pi}{I}\right] \tag{2}$$

where ARR is accounting/average rate of return (%), Π is the annual project profit, I is the amount of initial or average investment, and T is the life span of the project.

Like the PBP, ARR also has practical weaknesses. It does not take into account the time-value of money, and does not consider the timing and pattern of profits of the project. Moreover, it has got a problem of conceptual definition in its structure. The presence of scrap value or salvage value for a project and the availability of alternative depreciation methods make the ARR more complex and arbitrary [24]. Furthermore, ARR is not a useful method if a firm wants to evaluate multiple projects with different life spans [45]. In addition, the management is required to set a target rate of return as a prerequisite of applying ARR as an appraisal method. Despite variations in opinion, ARR is sometimes interpreted as return on investment, ROI, or return on capital employed, ROCE [24], and defined as an economic rate of return in certain circumstances [6].

ARR is widely applied in various ranges of projects. Different surveys confirm the existence of ARR as one of the main capital budgeting tools in business. Kelly and Tippett [17] argue on the importance of ARR in relation to the stochastic cash flow forecasting process of a project. Moreover, only 9% of the total surveyed firms failed to use ARR as an investment evaluating mechanism [8]. However, the trend of applying ARR in major projects is declining. According to the various researches made between 1975 and 1992, the ARR was reported to go through such a continuous decreasing trend, from 12 to 0%, during the survey periods [22,40].

2.2. The discounted cash flow (DCF) methods

Although the concept of present value dates back to the 1540s [23], the theoretical foundation of the time-value of money was laid by Fisher [14]. However, the application of time-value of money for investment appraisal began very recently. The seminal papers of Modigliani and Miller [32,33], the MM model, lays the basic foundation for today's investment appraisal technique using the time-value of money. From the MM model, the Weighted Average Cost of Capital (WACC[3]) is derived, with which the investment cash flows are discounted. Using the WACC, most of the time-value based investment appraisal methods are employed to evaluate the worthiness of an investment.

The DCF technique had emerged as a practice to evaluate investments during the 1970s [26]. Under DCF, a number of techniques have been developed for the purpose of investment appraisals. The net present value (NPV), the internal rate of return (IRR), the net terminal value (NTV), and the profitability index (PI) are some among the methods. The NPV and the PI methods are very similar; differing only in the presentation, as an absolute figure and as a ratio, respectively. The discussions which follow focus only on the first two methods as they are widely used in evaluating investments.

[1] The concept is changed into formula.

[2] The concept is changed into formula.

[3] WACC = (after tax cost of debt) × (proportion of debt in the capital structure) + (cost of equity) × (proportion of equity in the capital structure).

2.2.1. The net present value (NPV)

As its name implies, NPV is the difference between two categories of DCFs. It nets the present value of the investment from the present value of the benefit of the project (revenue). Mathematically, the NPV can be presented as follows (see, for example, Ref. [49], p. 71)[4]:

$$\mathrm{NPV} = \sum_{t=1}^{T}\left[\frac{\mathrm{NCF}_i}{(1+k)^t}\right] - \sum_{i=1}^{T}\left[\frac{I_i}{(1+k)^t}\right] \tag{3}$$

When the investment (I) is made at the beginning of the period $t = 0$), the formula will be:

$$\mathrm{NPV} = \sum_{t=1}^{T}\left[\frac{\mathrm{NCF}_i}{(1+k)^t}\right] - I_0 \tag{4}$$

where NPV is the net present value, NCF_i is the net cash flow from the project at period i, k is the cost of capital, I_0 is the amount of investment, and T is the life span of the project.

As a rule, projects are accepted if their NPV is positive. When we have a number of projects, we may rank them according to their PI[5]. NPV considers all cash flows of the project and accounts for pattern and timing of the cash flows. NPV is assumed to measure the net worth of the firm as a result of the changes caused by the project.

However, it has not been possible to prove a rigorous link between NPV and the owners' objective of wealth maximization [10,53].

There are several drawbacks of the NPV method applied for investment appraisals. In mutually exclusive projects (differing in life and initial investment), the NPV may lead to different decision results. Moreover, it requires and assumes equal class of risk for both cash inflows and outflows of the project.

Despite these criticisms, NPV continues to be one of the most widely applied DCF techniques in business and industry. Chadwell-Hatfield et al. [8] have found that 40% of the sample firms apply NPV in their capital budgeting program.

2.2.2. The internal rate of return (IRR)

Historically, it is believed that IRR was coined by statisticians to solve the puzzle of equality of future cash inflows to specific outflows of the current period [41]. IRR is the rate that equates the cost and benefit of the project in terms of present value. The internally generated return is used as a cut-off rate to evaluate the benefit/cost of the project. In contrast to NPV, it provides the rate of return that the project will provide if it is accepted. At the rate of IRR, the NPV of the project will be zero, implying that IRR is the maximum cost of financing the project. IRR produces the discount rate of cash flows. The IRR can be computed using the following formula (see, for example, Ref. [27], p. 663)[6]:

$$\mathrm{IRR} \Rightarrow \sum_{t=1}^{T}\left[\frac{\mathrm{NCF}_i}{(1+k)^t}\right] - \sum_{t=1}^{T}\left[\frac{I_i}{(1+k)^t}\right] = 0 \tag{5}$$

The purpose of the above equation is to find k, the discount rate. When we assume the initial investment (I) is made at the beginning of the period ($t = 0$), the formula will be:

$$\mathrm{IRR} \Rightarrow \sum_{t=1}^{T}\left[\frac{\mathrm{NCF}_i}{(1+k)^t}\right] - I_0 = 0 \tag{6}$$

where IRR is the internal rate of return (%), NCF_i is the net cash flow from the project at period i, k is the discount rate, I_0 is the amount of investment, and T is the life span of the project.

IRR is simple to interpret as it shows percentage benefit from the given investment. IRR is found to be more convenient than other DCF methods since the discount rate need not be computed in the application. The advent of high capacity computers makes the previously laborious task of computing IRR easy. However, there are drawbacks of the IRR appraisal method. One of the shortcomings of IRR is that sometimes the solution is non-unique giving multiple rates when we have non-conventional patterns of project cash flow (i.e., outflows are followed by inflows or vice versa). Moreover, IRR assumes the same rate of lending and borrowing, which is contrary to the practical world. It also assigns equal cost of capital for each year of discounting as does the NPV method [7].

Curing the problems of IRR has been tried by decomposing some of its problems. For instance, a method to narrow the gap between actual and forecasted cash flows, called *profiling the IRR*, has been proposed. This method adjusts the deviation of the IRR, caused by cash flow deficiency, through the capital recovery system [11]. Another attempt has been made by using ARR to compute a conditional IRR subject to measurement errors [6]. A modified rate of return (MRR) has also been tested academically to alleviate the problems of IRR. Under the latter approach, interest rates are adjusted to bring equality between project cash outflows and negative project balances [20,23].

Despite these problems, there are a number of firms who use the IRR as an appraisal tool. A study of 150 major British firms reveals the popularity of IRR as an investment evaluating technique [38]. In addition, surveys

[4] The format is rearranged.

[5] PI is the present value of NCF divided by initial investment.

[6] The format is rearranged.

made by Chadwell-Hatfield et al. [8] found the highest percentage (72%) rank given to IRR among DCF methods of capital budgeting. Furthermore, the survey result for the last 15 years indicates that larger firms prefer IRR more than smaller firms [9].

3. Other approaches to investment appraisals

Although not widely used, a number of alternatives have been proposed by different researchers with the aim of reducing the problems of the DCF-based methods. These methods are in one way or another, a continuation of the previous DCF methods; and, hence, most of the problems of the DCF have a spillover effect on the newly proposed methods. The three most commonly mentioned proposals are the option pricing, the adjusted present value (APV) and the equity cash flow (ECF) methods.

3.1. The option pricing

One of the areas of application of capital budgeting tools is valuing opportunities of future investments. These are future options that the firm is going to use or not depending on their interest. Hence, investments can be regarded as future option, which entails rights but not obligations to take some action in the future [13]. According to the option theory, most of the business investment decisions are assumed to be irreversible and involve greater uncertainty; and, hence, this behaviour is similar to the financial call option of a business. On the other hand, the standard capital budgeting methods such as NPV assume reversibility of investment and automatic operation of projects: starting and completion, ignoring the degree of uncertainty.

The major advantage of the option approach is its capacity to incorporate uncertainty by delaying the investment decision-making time, and consideration of alternative investments within the given time frame. Dixit and Pindyck, [13] recommend the option pricing method for such investments as oil reserves, utility planning when there are scale versus flexibility issues, and for those areas where product prices are highly volatile.

3.2. Adjusted present value (APV)

The existence of fallacies in the practical application of basic assumptions of the cost of capital (k), causes an adjustment in the investment decision process. Myers [35] proposed the application of adjusted present value to correct such errors in the standard capital budgeting methods. According to this theory, the APV is obtained by separately treating the cash inflows and outflows of the project, and summing up the present value differences to determine whether APV is above or below zero.

3.3. The equity cash flow (ECF)

Luehrman [26] proposes three different methods of capital budgeting tools for the three different areas of investment. According to this approach, the firm's investment decision is divided into three: future opportunities, asset-in-progress and ownership claims. As these areas of investment are different, it is argued that different methods are essential to evaluate their worth. Accordingly, the methods are classified in such a way that, new investments can be evaluated using option pricing method, while the on-going asset of the firm is using the APV method. Finally, the ownership claim is evaluated using the expected and discounted cash flow of the stocks of the firm by the ECF method.

4. The current trend in the capital budgeting methods

So far, three groups of investment appraisal techniques have been discussed. The last group has emerged as a remedy for the problems of the first two groups. The first two groups, non-DCF and DCF, are extensively applied in business, while the last group has not yet been tested practically. In general, research shows the use of combined methods of the first two groups of appraisals [47,52]. However, various researches confirm the presence of a trend shift from the traditional to the more sophisticated DCF methods [8,39,40,47].

In the area of investment appraisals, research emphasis has been made, and is still, mostly on the DCF rather than on other methods. Moreover, the practice is towards the use of the DCF method than other methods. On the other hand, complaints are also growing about the application of these methods, which call for the design of a new method. Studies made by Kennedy and Sugden [19] have failed to show a positive correlation between the DCF method and firm profitability. Since DCF ignores the preparatory stages of investment decision and the effect of active management, it is mostly found as a cause for the rejection of strategic investments [19,30]. Furthermore, the application of DCF is limited to certain areas, and hence, there is no justification for its complete validity in all investment categories. For instance, it has not been used to evaluate the working capital investment, R&D, or in most of the purchases of fixed assets of a firm [1].

The paper by Tyrrall [51] clearly stipulates the current situation of the DCF method. In this paper, he argued that it is not by the merit of the DCF that investments are accepted in business, but by the expectation of investors in the market. One of the difficulties of the DCF method is short-termism. Investment in R&D is made with strong expectation of long-run development, which might result in negative cash flow in the short-run. Thus, with this objective of the firm and the reality,

such projects of innovation cannot be accepted under the narrow focused standard investment appraisal methods of today.

Another situation where the standard investment appraisal methods fail to assist the management is in the evaluation of Information Technology/System (IT/IS) projects. The feasibility of such projects is not justifiable until implementation, due to the intangible nature of the benefit, and hence, it cannot be favored by the current appraisal methods. Studies documented that IT/IS projects cannot be justified by the current appraisal methods due to the problem of identifying direct (indirect) costs and the problem of maturity of the benefits at the time of implementation [16].

Companies are now searching for means to substitute the old-aged investment appraisal methods. For instance, some Japanese companies have shifted from DCF appraisal methods to a method that indicates the availability of cash for the next stage of development [51]. The over simplifying effect of forecasting the returns, and the increasing complexity of the tax systems of countries make the DCF method's value less in the real estate business [45]. The impact of the DCF technique in evaluating leverage buyout (LBO) business is also another problem. As a result, a number of big companies are found to be suffering from incompatible investment appraisal method [41].

5. Investment appraisal methods: a critical assessment

The DCF methods we use today are valuable to appraise projects in progress, to evaluate new ventures and to determine ownership claims in business. However, these standard appraisal techniques have got a number of significant shortcomings particularly if they are measured in relation to their focus on shareholders wealth creation. The following paragraphs summarise some of the critical problems of these methods.

1. Projects are appraised using one or more of the DCF techniques. However, the performance evaluation of these projects, after their implementation, is done using non-DCF methods such as price earning (PE) ratio, economic value added (EVA), return on investment (ROI), etc. This creates the following problems:
   - DCF methods measure profitability in terms of time-value of money while the evaluating criteria judge the performance of projects without taking into account the effect of time on the value of money and thus, disconformity in the measurement results.
   - DCF methods measure profitability of a project before implementation and use forecasted cash flows, while the performance evaluating techniques are based on the actual cash flows during the performance period.
   - The results of DCF methods are constant over the life of the investment whereas the performance results are dynamic, which correspond to the variation in the business cycle, micro-economic changes, and changes in the general business environment.

2. When assessing the value of an individual project, an organisation may accept a project from an unprofitable part of the business if it has very high indirect costs and low direct costs. Although the current appraisal methods treat R&D costs as sunk cost, the firm must go on supporting the product with on-going R&D in choosing to stay in that business. Furthermore, when assessing a portfolio of a project, NPV and IRR will favor projects with high indirect costs and low direct cost. This causes several problems:
   - It favors projects from unprofitable parts of business.
   - It contradicts the conventional management thinking that it is better to have high direct costs and low indirect costs (the concept of controllability of direct costs).

3. NPV and IRR take no account of the new debt required to finance the project. It is common practice to run overspent projects, which require additional debt for completion. Hence, unprofitable projects may continue to operate without considering the consequence of the additional debt.
4. The DCF methods do not take into account the opportunity lost as a result of pursuing the current alternative. The current methods are based on the principle of invest now or never.
5. Since NPV and IRR values are computed before the project starts, subsequent changes in the project environment will not be accommodated. Any effect resulting from such changes, therefore, will lead the project team to choose a solution based on gut reaction or preconceptions. This creates a number of problems:
   - It increases uncertainty about the choice of the most important variable to control and path to follow.
   - It requires an additional burden on the team to understand the interdependence of variables.

6. Some of the DCF methods may provide unrealistic rates of return; others are too sensitive to errors. Moreover, IRR and NPV assume the same class of risk for both cash inflows and outflows of the investment, which is contrary to the real world situation.

7. The standard investment appraisal methods do not consider the strategic importance of projects. Moreover, the methods have limited capacity to identify the value creating/destroying elements in a project.
8. Using several options for solving a problem on a project as a "portfolio of projects" and applying NPV for comparing these options can go part way in solving this problem. It provides a valid comparison of the options, but still suffers from the following problems:
   - It takes little account of the financial ratios of the firm.
   - Even though an option may be the best from the current position, it may still lead a project towards unprofitability.

In general, all these problems indicate that it is high time to deal critically and assess the relevance of the current investment appraisal methods, and to address the eventual design of the new standard. Hence, new ways of appraising projects may be required to alleviate some of the problems of the standard investment appraisal techniques. A new proposal should, at least, help to:

1. assess the impact of projects on the value of the firm;
2. recognise the on-going commitment on R&D for products involving high indirect costs;
3. take better account of rising and falling costs (direct, indirect and cost of capital) through economic cycles in assessing the risk of the project;
4. provide clear-cut guidelines as to the choice among competing projects (options);
5. provide a clue to identify value creating/destroying variables of projects;
6. provide new ways of comparing a portfolio of projects, project recovering mechanisms and project control tools;
7. provide a mechanism to evaluate special projects, such as IS/IT projects, real estate development, etc.;
8. provide a method of monitoring and controlling on-going projects to make a comparison against the standard and maintain the shareholder value, and
9. maintain the merits of the current investment appraisal techniques.

6. SVA as investment appraisal tool

In the beginning of the 1980s, the seminal work of Alfred Rappaport proposes a new method of value measurement called shareholder value analysis, SVA [42]. Shareholder value (SV) is the value of the equity portion of the firm's financing [43]. Similar to other DCF methods, SVA is based on discounted cash flow of future benefits and costs. SVA is a strategy and a tool useful to analyze individual or mutually exclusive projects, mergers, acquisitions, expansions, divestments, etc., in business. SV of a single project can be expressed using the following relationship (see, Ref. [42], p. 49)[7]:

$$\mathrm{SV} = \left(\sum_{t=1}^{T} \left[\frac{\mathrm{NCF}_i}{(1+k)^t} \right] - \sum_{i=1}^{T} \left[\frac{I_i}{(1+k)^t} \right] \right) - \beta \tag{7}$$

The first term on the right-hand side of Eq. (7) is the same as the NPV presented in Eq. (3). Thus, we can rearrange the SV formula as follows:

$$\mathrm{SV} = \mathrm{NPV} - \beta$$

where SV is the amount of contribution from the project to shareholders and β, the market value of debt used to finance the project.

Like most of the theories of finance and economics, the SV approach is also based on a number of assumptions. The firm is assumed to identify true value creation. Moreover, the planning period, the time-value of money, and risk-return relationship are some of the fundamental assumptions of the model [12,46].

Researchers such as Rappaport [42,43], Moskowitz [34], Ruhl and Cowen [46], Mills [29], Mills and Print [31], and Turner [50] have categorized the critical revenue and cost determinants of SV. These are: sales growth rate, operating profit margin, income tax rate, incremental investment in working capital, incremental investment in fixed capital, replacement of fixed capital, the cost of financing (cost of capital) and forecast duration (the planning period).

These value drivers can be decomposed into their constituent components. For example, the incremental working capital is composed of accounts that constitute the working capital, such as receivables (debtors), inventory (stocks) and other current assets. That is, the incremental working capital required as a result of increase in sales is reflected in increasing investments in receivables, inventory and/or other current assets. Thus, percentage increases in working capital accounts, caused by sales increase, give us incremental investment in working capital. Similarly, we can express the incremental fixed investment by the items of the fixed investment in the balance sheet of the project/firm.

SV is consistent with the value maximizing objective of the firm. It facilitates better resource allocation in the firm and prevents mere growth without profitability. It provides a base for executive compensation that further

[7] The format is changed.

aligns owner–manager goals [36,43]. By analyzing the value drivers, SV helps to identify the sources of value creation and destruction in the firm [2]. It not only strengthens the planning and forecasting capacity of the firm, but also minimizes value gaps between incoming and outgoing CEOs of the firm [4].

SV is a strategy that can be applied not only to firms, but also to individual business units [48]. SV should also be a prime goal for a firm [3]. Thus, the application of SV strategy is extremely wide from individual project to mergers and acquisitions; from introduction of new product to divestment; in short, in every business sector.

More than 15 years have passed since most American firms began to single out SV as a central mission of corporate strategy [44]. Firms are expressing their concern on using the old traditional methods. Various types of evaluation methods have been proposed by researches as part of the academic exercise and to solve this business concern. For instance, Cho [10] has developed an approach to evaluate the SV without considering the effect of external financing. However, SVA is gaining higher momentum among the proposed candidates of measurements. Researches focused on the linkage and evaluation of R&D projects to SV by Boer [5] and Kelm et al. [18] are prime examples of the academic effort attached to the importance of the SVA.

In practice, many companies are changing their attitude from traditional to the SV both as an objective and as a tool. A survey conducted by Philip [37], for Canadian Chartered Accountants and Financial Executives, reveals that 90% of the companies participating in the survey specifically stated that SV is their objective and is used as a means of both internal and external communications.

7. SVA and project control

It is essential to emphasize the role of SVA in performance evaluation and project control. As it is a multifaceted model, containing appraisal and evaluation, it will be much easier to compare the actual result against the intended value computed at the time of appraisal. Moreover, since SVA measures in terms of present value figures, it will minimize problems of scaling results of various methods. SVA can also be applied in all phases of a venture.

Since decision-making is pervasive irrespective of stages and phases, we need a consistent and pertinent method that passes through all these stages of a project. Moreover, a method is preferable if it has a capacity to be extended from stage of appraisal to performance evaluation and control of project activities. This combination has got many advantages beyond its simplicity in the application. It adds to consistency of measurement when we pass from one phase to the other, and reduces cost of information production and flow. The SVA is a good candidate that can satisfy all the requirements of valid measurement.

In general, the time interval for control and performance measurement of projects can be divided into three: project performance measured from the beginning to the current period; from the current period to the final estimated life; and complete valuation from the beginning to the estimated end. At all these junctures, project managers can identify, correct and adjust any discrepancy from the expected target of SV. Moreover, by applying SVA, errors of the past will be easily investigated; current problems will be fixed in time and precautionary signals about the future path of the project may be easily collected.

Another strong side of the SVA, as a model, is its facility to decompose its constituencies for further independent analysis. That is, controlling will be easy by identifying value-creating factors from those that destroy project value. This provides motivation to continuously audit the progress of the project. In this circumstance, SVA represents a type of cybernetics control tool whereby the immediate feedback is going to be part of the input to the ongoing process so as to correct the future expected errors. Hence, the past evaluation will assist in estimating the direction of the project in the future. The one time frame result checks the future periods, and it keeps continuously checking the health, while the project is in progress.

7.1. Illustration of SVA

Let us assume a hypothetical project at an initial cost of £70 million with estimated life of 5 years. Assume also that the initial investment is made at the beginning of the project period and the project has a debt equity ratio of 50% in its financing. The forecasted cash flows and the appraisal results of the project are presented in Table 1. As per the analysis presented in Table 1, the project is expected to generate an NPV of £3.77 million[8], and provides greater IRR as compared to its cost of capital. However, the project could be rejected under the SVA method as it reduces the value of shareholders by £31.2 million. For the purpose of our discussion, let us assume the project is accepted for implementation based on the results of the traditional investment appraisal methods.

Let us further assume, after the third year, that the project situation is changed. And it is found to be overspent, and requires additional investment of £15 million for completion. Moreover, the latest cash flow forecast reveals that there will not be any collection at the end of year 5. The recomputed cash flow is given in Table 2. The analysis based on the NPV and IRR gives the same

[8] 15% discount rate is assumed.

Table 1
Forecasted cash flow and project evaluation

Years	0	1	2	3	4	5
Net cash flow (million £)	–	20	40	25	10	8
Investment (million £)	70					
NPV	£3.77					
PI	1.1					
IRR	18%					
SVA	£31.2					

Table 2
Recomputed cash flow and project evaluation

Years	0	1	2	3	4	5
Net cash flow (million £)	–	20	40	25	10	0
Investment (million £)	70				15	
NPV	£3.77 (as Table 1)					
PI	1.1 (as Table 1)					
IRR	18% (as Table 1)					
SVA	£42.7					

result as in Table 1 since these methods do not take into account any change occurred after implementation of the project. Thus, according to these methods, the project is still healthy.

When SVA is used, one can see a further decline in the value of shareholders by £10.48 million as a result of the changes. This decline in value is without considering the corresponding cost of additional equity financing, and the interest amount on the additional debt. Now, therefore, the decision choice will be whether to continue the project even if it does not give benefit to stockholders or to suspend the operation. If the decision is to continue, the shareholders will suffer by an amount indicated above plus the opportunity cost of their additional investment. On the other hand, if the project is suspended, at least there will be reduction in the additional loss of £1.8 million to shareholders (the difference between the SV at the end of the third year and the fifth year). According to SVA, therefore, the optimum period will be the end of the third year; and the project has to be suspended from the SV perspective.

8. Conclusion

Undoubtedly, the business needs some methods to evaluate and decide on its set of projects. As projects require a huge amount of scarce resources, one has to fully depend on the method of appraisal to the extent that it clearly guides as to how, when and which options to pursue. During turbulence, the initial appraisal may not be sufficient to run the project already in progress: continuous appraisal, auditing and monitoring mechanisms should also be employed to attain the desired objective.

The project environment is continuously changing. Hence, there is a need for a measurement that accommodates the shocks and that enables us to compare the current level of operation vis-à-vis the target at any given time. Shareholders are those who provide the financing resources of the project with no priority of claims. Hence, it is legitimate to start and complete the analysis of projects with the central idea of creating shareholders wealth at any point in time.

As it is discussed and illustrated above, current methods of appraisal need renovation. They have been used for decades and need updating by incorporating the new methods to respond properly to changing environment. Previously, alternative investment appraisals had been proposed as a remedy to the current problems. However, the market did not accept them, as they were unable to eliminate the fundamental problems of the old methods. Thus, an alternative investment appraisal tool like the SVA is proposed.

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