Accounting for the Impact of Sustainability and Net Present Value on Stakeholders

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The increasing importance of sustainability within the framework of organizational structures requires an adaption of the Net Present Value (NPV) criteria. We propose a modification to standard evaluation techniques that considers a social distance factor to other stakeholders when determining the appropriate discount rate for investment cash flows. We also set the modification appropriateness in the context of business and organizational form. It is our aim to encourage greater analysis of sustainability that considers the impact on all stakeholders in the analysis of investment opportunities.

Keywords: sustainability, NPV, stakeholders

INTRODUCTION

Traditional project evaluation in corporate finance is centered on the use of an appropriate discount rate and the relevant cash flows. Most often the recommendation is for firms to adopt positive net present value (NPV) projects. This purpose of this paper is to enhance the understanding of the NPV criteria in a time when there is increasing discussion about including stakeholders and sustainability in those decisions. We propose Sustainable Net Present Value (SNPV) criteria that combines the traditional NPV approach with the additional analysis of incremental cash flows or impacts to stakeholders that are discounted with both a social distance and appropriate discount rate.

Effective financial decision making and applying the principals of cost accounting to properly allocate incremental cash flows and opportunity costs can be enhanced by the employment of a SNPV decision process which reinforces the appropriate allocation to relevant stakeholders. In determining the relevant stakeholders, the organizational structure and goals will play an important role not only with respect to which stakeholders to consider, but also what is the relevant social distance to them and the resulting discount factors.

The focus of the implementation of SNPV is on how to apply theory to practice and the idea that much of what sustainability is about is efficiency and marketing. If a firm takes on a more sustainable project, it will still have an impact on the NPV of the project, positively or negatively, through changes to market reach, increases in efficiency, and decreases in costs. This analysis is consistent with current practices in accounting and finance. Incremental cash flows, whether they represent opportunity costs, and natural resource accounting should allocate those cash flows to NPV analysis. Those incremental cash flows that

represent positive or negative externalities are the flows to the relevant stakeholders. In terms of asset pricing and econometrics, the flows to the stakeholders are the ones that are uncorrelated (orthogonal) to the NPV flows. This paper will emphasize that as a more holistic approach, just the process of considering stakeholders, makes the traditional NPV approach stronger by reinforcing the allocation of incremental cash flows appropriately.

With much of the global news on climate change, racial equity, and the 2020 pandemic, it is more important than ever for organizations to understand their place in reaction and preparation for changes in market perception and governmental and regulatory responses. In August 2019, more than 180 CEOs at the Business Roundtable stated that they "affirm the essential role corporations can play in improving our society when CEOs are truly committed to meeting the needs of all stakeholders" (Stoll, 2019). With this statement the roundtable acknowledged the importance of customers, suppliers, employees, communities in addition to shareholders. It is in this light the role of NPV and now SNPV provides the structure for businesses to implement and correctly analyze value for all stakeholders.

Section one will provide an overview of social distance and discount factors in the context of sustainability and the stakeholder perspective. Section two will review issues of incremental cash flows to shareholders and stakeholders. Section three will revisit the advantages of NPV and SNPV over other project evaluation techniques. Section four provides the context in differences across organizational structures that will lead to the appropriateness of SNPV. Finally, section five will add a reminder of the role of uncertainty in planning for the future and the projects that will shape it. The conclusion is a reminder that following finance and accounting principles of incremental cash flows, net present value can still provide sustainable solutions.

SOCIAL DISTANCE AND DISCOUNT FACTORS

To be able to discuss sustainability and stakeholder value, it is necessary to have a common definition for sustainability. Unfortunately, there are a plethora of definitions for sustainability. The investment community uses Environmental, Social, and Governance (ESG) factors and ratings. The corporate finance and management disciplines rely on Corporate Social Responsibility (CSR) and the accounting discipline has taken on natural cost accounting. While acknowledging the disparate contexts of each, there are similarities that cross all definitions. The commonality is that all consider the effect that one's actions has on others. In the business context, others are the stakeholders. The effects are the externalities, positive or negative, upon the different stakeholders. To unify the discussion, we propose the adoption of social distance as a discount factor.

Social distance was first introduced by Becker (1968) in reference to the value of a dollar to members of a family. A social distance of zero implies that a dollar to family member is worth a dollar to other family members. Anderson and Myers (2018) employ Becker's social distance to create a framework to unify the disparate sustainability definitions into a model of economic growth, consumption, and social distance. One example of employing social distance to assist in decision-making is applying social distance to explain the ordering of the United Nation's Sustainable Development Goals (SDGs), Myers (2020). The SDGs cover poverty, equality, environmental, and responsible consumption issues. If one assumes that the order of the goals (1-17) represents the decreasing utility of the goals, goal one being the highest priority or greatest good to end poverty and as a typical discounted cash flow model with increasing time, then the addition of a social distance as a discount factor explains the ordering of the goals.

TABLE 1
UN'S SUSTAINABLE DEVELOPMENT GOALS (2015-2030)

http://www.un.org/sustainabledevelopment/development-agenda/

1. No poverty
2. Zero hunger
3. Good health and well-being
4. Quality education
5. Gender equality
6. Clean water and sanitation
7. Affordable and clean energy
8. Decent work and economic growth
9. Industry, innovation and infrastructure
10. Reduced inequalities
11. Sustainable cities and communities
12. Responsible consumption and production
13. Climate action
14. Life below water
15. Life on land
16. Peace, justice and strong institutions
17. Partnerships for the goals

While viewing the UN SDGs as an ordered set of choices across different constituencies may be enlightening, it is the application to businesses and organizations that is the focus. With the Business Roundtable confirming the role of stakeholders to the decision process beyond Friedman's goal of maximizing shareholder wealth, a consistent process is needed that considers the value to all stakeholders.

The key role of social distance is to be a metric for comparison among choices made. As the intertemporal marginal rate of substitution is to consumption through time, so social distance is to consumption or investment among stakeholders. The role of discount rates (intertemporal or social) have been central to consumption models in economics. Even in environmental economics, Ramsay (1928) introduced the concept of appropriate discount rates when considering the effect on intergenerational transfers which translates directly to environment impacts on future generations. It is from this basic understanding of environmental impacts on future generations and appropriate discount rates that social distance fits. While societal issues of environmental impact may be addressed by governments and governmental agencies, individuals, businesses, and organizations must fit within societal and governmental norms and regulations in maximizing their own utility. Voluminous studies such as *The Stern Review* (2007) in the United Kingdom or the austere group in Arrow et al (2013) have attempted to bring agreement to discount rates in the realm of the environment and intergenerational transfers.

Since decision-making in optimizing stakeholder value along with shareholder value encompasses issues beyond climate and environmental to stakeholders in current and future generations, social distance is that much more appropriate on the individual or organizational level than the lofty and overreaching goals of Stern (2007) or Arrow et al (2013) intergenerational discounting. The issue of intergenerational transfers on a societal level borders on the philosophical and ethical realm once one considers the multitude of people in future generations. Even in C.S. Lewis (1947), there is a discussion of the power of present generations over nature and future generations by the decisions they make. Later in the environmental economics literature the language becomes starker when described as "dictatorship of the present versus the dictatorship of the future" (Daly and Townsend, 1992). Given that overconsumption in the present may have a huge impact on the ability of future generations to consume or even survive, this generation is

dictating to them what their lives will be like. Similarly, if this generation were to drastically reduce our consumption for the complete benefit of future generations then that would be a dictatorship of the future.

Social distance is more aligned across stakeholders in the same manner as the UN SDGs coverage of current and future generational effects and is reflective of the decisions that businesses, organizations, and individuals make. The differences in the utility functions (social distances to particular stakeholders) will vary across the decision-makers. One does not expect the corner grocer to have the same social distance to employees, customers, suppliers, and their current and future communities as a large multinational nor have the same impacts or externalities. Consequently, determining the appropriate social distance and therefore discount factors will be dependent on the decision-maker. This will be covered in more depth in the section on organizational structure.

In most economics, accounting, and finance literature, the concept of discounted cash flows is paramount to decision-making. For a single future cash flow, the present value is found by discounting with an appropriate rate, R, over T periods. Where the appropriate discount rate is typically a function in nominal terms of the risk-free rate and a risk premium.

$$Present\ Value = \frac{Future\ Value}{(1+R)^T} \tag{1}$$

The discount factor is

$$Discount\ Factor = \frac{1}{(1+R)^T} \tag{2}$$

The addition of social distance, δ, changes the implied discount factor to:

$$Implied\ Discount\ Factor = \frac{1}{(1+R+\delta)^T} \tag{3}$$

Let us return to the UN SDGs and provide a simple example of combining discount rates and social distance measures to explain or interpret the ordering of the goals as if the order is only a function of time discount and social distance. For the first 4 goals, the assumption of time is nearly immediate or within 1 year. For goals 5-10, the assumption is of intermediate goals and time of 5 years. Finally, for the more distant goals, time is assumed to be 15 years since the UNSDGs are to be measured from 2015-2030. Overlaying the time assumption, there is an ordering for social distance within each of the time frames as depicted in Table 2. The resulting implied discount factors and implied discount rates provide the same ordering as the UNSDGs. The key takeaway is that there is a combination of time and social distance to the value of a dollar today towards the goals.

TABLE 2
UNSDGS, SOCIAL DISTANCE, AND DISCOUNTING

UNSDGs	Time (T)	Social Distance (d)	Implied Discount Factor
No Poverty	1	0.010	0.943
Zero Hunger	1	0.020	0.935
Good Health & Well-Being	1	0.030	0.926
Quality Education	1	0.035	0.922
Gender Equality	5	0.010	0.747
Clean Water & Sanitation	5	0.020	0.713
Affordable & Clean Energy	5	0.030	0.681
Decent Work & Economic Growth	5	0.035	0.665
Industry, Innovation and Infrastructure	5	0.040	0.650
Reduce Inequalities	5	0.045	0.635
Sustainable Cities & Communities	15	0.010	0.417
Responsible Consumption & Production	15	0.020	0.362
Climate Action	15	0.025	0.338
Life Below Water	15	0.03	0.315
Life on Land	15	0.035	0.294

In our example, R is 5%. That is a $1 is worth $0.943 towards the no poverty goal and only about $0.29 to the life on land goal. Environmental economics argues in favor of a very low to zero discount rate to recognize the number of individuals in future generations to provide for sustainability. The aim here is not to generate social utility decisions for a society, but to provide a methodology for current individual organizational decisions to understand the implied social distance and the consequence of that implied social distance on the value to intergenerational transfers to their stakeholders.

Having outlined the definition of sustainability via the UN SDGs and introduced social distance, the next step is to provide some background to the economic assumptions necessary for analysis of sustainability decisions. In the discussion of model choices, most of the introductory models are single period models with certainty. That is a decision is made today and the outcome is measured one period out. For example, in time value of money calculations, discount rates, are based on a dollar today versus a dollar tomorrow, but tomorrow could be any period in the future. While models of certainty and single periods are a nice beginning, life and decisions are uncertain and decisions today will be impacted at many intermediate periods before the "tomorrow" is reached.

It is straightforward that if one is only considering shareholders as with Becker's family, the social distance is zero and the default discount factor falls out. Similarly, in the Friedman model of maximizing shareholder wealth, the social distance to other stakeholders, current or future, would be infinite and the implied discount factor would be zero. Continuing to expand the understanding of social distance in respect to discounted cash flows to shareholders and stakeholders, the discussion moves from the discount rate or factor to the cash flows.

INCREMENTAL CASH FLOWS TO SHAREHOLDERS AND STAKEHOLDERS

Determining incremental cash flows in project analysis relies on finance and accounting approaches. If incremental cash flows on supposed sustainability projects are correctly accounted for through traditional or natural accounting, most will fall into traditional impacts on shareholder wealth. For example, selling organic apples is dependent as much if not more on the demand of organic apples, then it is on the demand for the impacts on current or future communities. It is incumbent on the decision-maker to determine which incremental cash flows are for shareholders or stakeholders. As mentioned in the introduction, the externalities, positive or negative, to stakeholders are those that are orthogonal (uncorrelated) to the cash

flows to the shareholders. In the organic apple example, the benefit to current and future communities of reduced pesticides is outside the benefit to shareholders from being able to charge a higher price. If the production of the organic apple is more costly, then again it is the incremental net benefits and costs that are allocated to shareholders and to stakeholders.

On assigning social distances, the key, similar to any utility function approach, is to have consistent and transitive choices at any one point in time (allowing preferences to change through time). It may be that social distances may indeed grow towards infinity and the Friedman maximizing shareholder wealth objective. The intermediate step is determining when the effect on stakeholders is "large enough" to matter as Karpoff (2020) argues. This will be dependent on the size of the incremental cash flow and the determined social distance. If incremental cash flows to stakeholders are small enough or the social distances large enough, then the effect on these decisions will be insignificant. This is one reason that the process of allocating the incremental cash flows will make the traditional decisions better and inform the decision maker when stakeholders are affected enough to change decisions.

The management and its CSR literature confirm how good CSR actions can make a firm more profitable. Karpoff (2020) provides an excellent summary of this literature in his introduction. Those sustainable decisions are still aimed at maximizing shareholder wealth.

The other stakeholders to consider, as confirmed by the Business Roundtable statement, are employees, suppliers, customers, and the community present and future. When considering incremental cash flows or externalities to employees, categories of wages, hours, health, and environment will still largely impact productivity and cash flows to shareholders. Even issues of diversity (gender or race) have been shown to affect productivity and creativity.

Most of the issues with the future community appear more environmentally related than the other stakeholder categories. There are still issues that would affect traditional incremental cash flows given the impacts on future economic issues driven by environmental impacts.

ADVANTAGES OF NPV AND SNPV

Having covered discount rates and cash flows and the relationship with stakeholders and social distance, the next step is to combine them into the traditional discounted cash flow model and NPV and SNPV analysis. NPV criteria is typically highlighted as the first best choice for project analysis over other criteria such as internal rate of return, payback period, and discounted payback period. This holds true in sustainability issues as much or more given the implications of longer-term impacts on shareholder and stakeholder value.

The following section highlights the advantages of NPV and SNPV for assessing sustainable business practices. The decision rule for both NPV and SNPV is to accept positive projects. If the negative externalities are "large enough" to drive SNPV to be negative when NPV is positive, then this reflects the cash flow size, large, and the social distance being close enough to impact decision maker's utility function.

SNPV is the double summation of stakeholders j=1 to N and time t= 1 to T with social distances, δ_j. Shareholders are assumed to have a social distance of zero, $\delta_j=0$. When SNPV is equal to NPV it is assumed that the impacts or cash flows to non-shareholders is equal to zero or social distance is infinite ($\delta_j=\infty$). The infinite social distance to other stakeholders would be equivalent to Friedman's maximizing shareholder wealth.

$$SNPV = \sum_{j=1}^{N} \frac{C_{j0}}{(1+\partial_j)} + \sum_{j=1}^{N} \sum_{t=1}^{T} \frac{C_{jt}}{(1+R+\partial_j)^t} \quad (4)$$

In the traditional Friedman context, non-shareholders with an infinite social distance (zero discount factor), SNPV collapses to NPV.

$$NPV_0 = -C_0 + \sum_{t=1}^{\infty} \frac{C_t}{(1+R)^t} \quad (5)$$

SNPV for a project's value may be rewritten as NPV plus the discounted cash flows to other stakeholders:

$$Project\ Value = NPV_0 + \frac{C_{j0}}{(1+\partial_j)} + \sum_{j=1}^{N} \sum_{t=1}^{\infty} \frac{C_{tj}}{(1+R+\delta_j)^t} \quad (6)$$

To highlight the differences between NPV and SNPV and social distances' effects a series of assumed cash flows to shareholders and other stakeholders is presented in Table 3. The NPV criteria and SNPV criteria are both met as they are both positive.

TABLE 3
NPV AND SNPV

Time	Cash flow to Shareholders	Cash Flow to other Stakeholders
0	-15000	-500
1	7000	-300
2	4200	0
3	4000	0
4	2000	200
5	2000	100
NPV	1,778.94	
SNPV	1,224.95	

For this example, we assume the discount rate (R) is 6% and the social distance (δ) is 3%. The NPV of the project is $1778.94 considering only shareholders. Once other stakeholders are included the SNPV of the project is $1224.95. Under both NPV and SNPV, the project would be accepted. To emphasize the advantages of NPV and SNPV over other decision criteria, payback and discounted payback are examined below.

Using the example above with the same cash flows, payback (Table 4) using both project cash flows and total cash flows including those to other stakeholders would be:

TABLE 4
PAYBACK

Time	Cash flow to Shareholders	Cash Flow to other Stakeholders	Net Cash Flow w/o CSR	Net Cash Flow w/CSR
0	-15000	-500	-15,000	-15,500
1	7000	-300	-8,000	-8,800
2	4200	0	-3,800	-4,600
3	4000	0	200	-600
4	2000	200	2,200	1,600
5	2000	100	4,200	3,700
Payback			2.95	3.27

By considering other stakeholders, the payback period increases by almost 4 months.

One of the drawbacks of payback is that it ignores the time value of money, so an alternative is to find the discounted payback period. Again, using the example, with R=6% and social distance equal to 3%,

TABLE 5
DISCOUNTED PAYBACK

Time	Cash flow to Shareholders	PV (at 6%)	Cash Flow to other Stakeholders	PV at 9% Social Distance factor 3%	Net DPV Cash Flow w/o CSR	Net DPV Cash Flow w/CSR
0	-15000	-15000.00	-500	-485.44	-15,000.00	-15,485.44
1	7000	6603.77	-300	-275.23	-8,396.23	-9,156.89
2	4200	3737.99	0	0	-4,658.24	-5,418.91
3	4000	3358.48	0	0	-1,299.76	-2,060.43
4	2000	1584.19	200	141.69	284.42	-334.56
5	2000	1494.52	100	64.99		1224.95
				Discounted Payback Years	3.82	4.21

The discounted payback period would be 3.82 without stakeholders and 4.21 with stakeholders. By taking into account stakeholders in a CSR framework, the discounted payback period increases by almost 5 months.

One problem that arises, however, is that for many CSR projects it takes longer to realize a return and most payback criteria are short-term oriented. Sustainable decisions, since they take future stakeholders into consideration, would be rejected more often under the payback method. So not only is NPV a better financial method as argued by finance texts, but NPV has advantages over payback with respect to sustainable projects.

Probably one of the biggest hurdles to sustainable decision making is the short-term incentives to corporations and their managers. The NPV rule is often overlaid with other criteria, especially payback or discounted payback periods. Payback is the time that the project takes to recoup its initial investment. This runs counter to the idea of sustainability with respect to future generations as well as being counter to the NPV rule. Having introduced managers, the SNPV approach does not escape the agency issues or control issues of an organization. In fact, the disagreement on social distance among owners and agents are the reason that the organizational structure is covered next. Another issue is that in many cases the incremental cash flows or the social distances are too small or too far to change the traditional NPV decision when framed as SNPV.

ORGANIZATIONAL STRUCTURE

In determining the appropriateness and depth to which SNPV analysis may be taken relies on issues of organizational structure, industry, size, and ownership control. Each of these aspects impact the degree to which there is agreement on social distance, importance of different stakeholders and their social distances, the relative size of the SNPV cash flows to different stakeholders.

The business or organizational form and structure and process of the implementation in a sustainable framework is important to the decision making of investments in products within the sustainable business structure. The differences in structure and form such as B-Corps, non-profits, institutions, partnerships, and corporations may shape the issues of both profitability and sustainability (the tradeoff of maximizing shareholder and stakeholder value).

Moving back towards corporations from charities highlights the dynamic nature of the social distance framework to different types of organizations. The flexibility of organizational/business design from non-governmental organization, charities and foundations, sole proprietorship, partnership, to Limited Liability Corporation can be mapped to the different social distances in the objectives of the organizations as summarized in Table 6. Charities would have lower social distances, B-corporations have the dual objective of financial and social that would have lower social distances, and corporations having highest social distances to non-shareholders. Friedman's maximize shareholder wealth is equivalent to infinite social distance to non-shareholders.

TABLE 6
ORGANIZATIONAL STRUCTURE WITH SOCIAL DISTANCE

Structural Form	***Social Distance***
Charity (foundation, NGO)	*Low to mission related stakeholders*
Sole proprietorship	*Zero to proprietor, low to proprietor's stakeholders*
Partnership	*Zero to partners, potentially low to partners' stakeholders*
B-Corporation	*Zero to shareholders and low to stakeholders*
Corporation (LLCs)	*Zero to shareholders (Friedman), High to stakeholders*

The typical corporate finance text discusses the advantages and disadvantages of different forms of business. The simplest structure is the sole proprietorship. The founder/owner of a sole proprietorship has one major disadvantage and that is personal liability. In the case of financial or legal liability the assets of the sole proprietor are subject to seizure. In the context of sustainability, there is another major advantage to adopting a sole proprietor structure and that is in terms of the goals of owner and their beliefs in social distance to stakeholders. Without the conflicts of agency issues between the owners and the managers, there is full agreement on social distance within a sole proprietorship.

As with sole proprietorships, partnerships are treated as individuals in terms of the life of the organization, personal taxes and personal liabilities. Initial advantages of partnership may be ease of structure during creation along with taxes. The dissolution of a partnership may be messy if not planned for in advance (think along the lines of divorce with and without a pre-nuptial agreement). Another potential benefit of a partnership would be if the partners are of a similar mind about sustainability and profits. Here there may be less agreement than a sole proprietorship but more than a larger public organization or firm in terms of social distances to stakeholders.

In the traditional finance text, most of the analysis is based on public corporations with shareholders. It is from this form that the objective of maximizing shareholder value from Friedman is based. Before public firms are address, the progression of business forms here will cover private corporations. Given that one of the issues that has been raised in other organizational structures is the agreement on social distance and stakeholders, the advantage to private and to some extent closely held public firms (more than 50% ownership in one party) is that stakeholder issues may be less contentious and more agreement on social distances to stakeholders. A quick example may be the Christian values of a firm like Chick-Fil-a. Family-owned organizations would be an intermediate step as long as there was agreement within the family about which stakeholders to emphasize with a lower social distance.

The last business or organizational form to be covered is the one most central to financial literature, the public corporation. Given the diverse set of shareholders and the pressures of public markets on profits, this form is potentially the least sustainable in the context of agreement on social distance to the stakeholders. If the corporation truly only cared for the shareholders in the absence of other stakeholders, then that would be the case. A theoretical adoption of shareholder only focus would imply a social distance of infinity. In practice, few decision makers would argue or afford an infinite social distance and zero discount factor to externalities on stakeholders.

There are advantages to firms by taking into account stakeholders such as employees, customers, suppliers, and community. Management research very much favors the diverse workforce which would be consistent with UN SDGs on gender and racial equality. Just as important are efforts by corporations to create and market products that may also support the UN SDGs for current and future generations. As governments become more involved in issues of climate change, there may also be opportunities for firms to take advantage and profit from those opportunities.

Non-profit organizations such as foundations, educational institutions, and non-governmental organizations (NGOs) have two distinct characteristics to their structure that relate specifically to sustainability. First, they are typically mission driven and that mission is related to stakeholders not shareholders. Stakeholders may include specific communities, donors, employees, and recipients related to the mission. The mission and recipients may represent intragenerational and intergenerational transfers. The American Red Cross disaster relief funds are an intragenerational transfer where an organization such as the Nature Conservancy may be aimed more to intergenerational transfers. Because of the common mission there should be less strife or disagreement about the social distance to the intragenerational and intergenerational cash flows. On the spectrum of sustainability, non-profits are at the more sustainable end than the traditional corporation in terms of shareholder to stakeholder objectives and agreement on social distance.

Assume that public corporations are Friedman maximize shareholder wealth decision-makers and charities are maximizing stakeholder maximizers with other organizational structures somewhere in between. The cash flows for a charity might appear as monies from donors passing through to the stakeholders or beneficiaries of the charity (Table 7). The larger percentage that is passed through the better the ranking of the charity (many of the charity rating systems use percent of funds to mission as a key criteria).

TABLE 7
CHARITY SNPV

R	Shareholders	Stakeholders					
5%		Employees		Beneficiaries		Community	
Social Distance	0%	20%		1%		10%	
Time	Cash flows	dj CF					
0	-1000000	100,000	83,333	800,000	792,079	100,000	90,909
1	-1000000	100,000	80,000	850,000	801,887	125,000	108,696
2	-1000000	100,000	64,000	900,000	800,997	150,000	113,422
3	-1000000	100,000	51,200	950,000	797,638	175,000	115,065
4	-1000000	100,000	40,960	1,000,000	792,094	200,000	114,351
5	-1000000	100,000	32,768	1,050,000	784,621	225,000	111,865
NPV	-5329477		352,261		4,769,316		654,307
	NO						
SNPV	446,408						
	YES						

For the charity (Table 7), the million dollars a year in donations goes to employee salaries, beneficiaries of the charities mission, and the community assuming some positive returns to both. The assumed social distances are consistent with money to the mission, 1%, having the greatest value or lowest social distance, followed by the community, 10%, and finally the employees, 20%. On an NPV basis the charity has a large

negative result, but on an SNPV basis the donors' monies have a positive impact and thus the charity would be successful in their mission.

While the charity example might appear an extreme example of social distance discounting, it provides the other end of the spectrum from the zero social distance example of a corporation maximizing shareholder wealth with an implied social distance of infinity to all other stakeholders. Somewhere in between the public corporation with high social distance and charities with low social distance is the B-Corporations with the dual objective of mission and profit. The B-Corporations represent the agreement on social distance to mission as it relates to the impacts on stakeholders related to their mission.

UNCERTAINTY AND BINOMIAL PRICING FOR SCENARIOS

While much of the analysis that has preceded has been rooted in certainty of the cash flows, in most cases financial analysis of projects is rooted in the uncertainty of the future. In most NPV analysis, the cash flows are unknown or unexpected. Expectations may be built on probabilities express in scenario analysis or sensitivity analysis. Instead of repeating the textbook coverage of these more expansive analyses, a simple reminder of the impact of uncertainty is covered using a binomial model. The rationale in a sustainability framework is that the traditional NPV has been supplemented with the additional uncertainty of the externalities on other stakeholders.

An example of the ethical or sustainable issues along with the externalities is drawn from the 1970s. The Ford Motor Company produced the Pinto with a design flaw that caused the gas tanks to explode in a crash. It was reported that Ford decided to pay off the families of victims rather than invest the $137 million to fix the problem. Among the numerous lawsuits brought, one in California had a $128 million award. To frame this in terms of SNPV, customers are the only additional stakeholder examined with their social distance, probability of negative externalities, and the costs of those externalities for the example.[1]

In 1983, the Environmental Protection Agency (EPA) issued its first economic guidance and reported a range of Value of a Statistical Life (VSL) estimates for use in policy analysis of $0.7 to $12.9 million (2001$) (USEPA 1983). This has been updated to employing $7.4 million (in 2006 dollars).[2] Using conservative assumptions of only $700,000 for VSL, including only the 500 deaths in Pinto accidents (ignoring injuries), and a probability of death per Pinto of (500 of the 1.5 million cars recalled in 1979), the implied decisions in terms of both NPV and SNPV are examined versus the cost of $137 million to fix the Pinto. For Ford to avoid fixing the Pinto, the cost of litigation is assumed to be the 500 deaths times the minimum VSL for a value of $350 million. This is still the traditional NPV approach in that the cost to the firm is based on expected cash flows from litigation versus cost of fixing the cars. In this approach, Ford may have erred in probability or magnitude. In probability the difference between the 0.033% of deaths per car would have to drop to 0.013% (or less than 196 deaths) to have a cost less than the $137 million to fix the cars. In magnitude, the VSL as the cost of litigation per death would have to drop from $700 thousand to less than $274 thousand per death. The above analysis takes place in the traditional NPV framework with social distance to stakeholders of infinity and the objective is still maximizing the expected shareholder wealth.

If the analysis is moved from NPV to SNPV and the social distance to other stakeholders is included, then the decision comes down to social distance level and probability. To put Ford in the best light, assume that the death rate is only 196, that is the probability is fixed at 0.013%. Further assume, the VSL is $274,000, then the expected litigation would be under $54 million and much less than the $137 million to fix the gas tanks. Now assume that the probability and VSL were correct at 0.033% and minimum of $700 thousand, but the externality is the difference between the $700 thousand and $274 thousand VSL. Ford's social distance discount factor would be 274/700 or 0.39; an implied social distance of 155%.

$$Social\ Distance, \delta = 1 - \frac{700}{274} = 1.55 \tag{7}$$

Any social distance less than the 155% would drive the decision to fix the gas tanks. Remember given the assumptions the 155% produces a SNPV cost of $137 million equivalent to the cost of fixing the gas tanks (or SNPV of zero given the alternative). As social distance drops from 155% to 0, the SNPV savings rise to the $350 million less the $137 million alternative.

The Ford Pinto example highlights why the decision process must include the impact on stakeholders in both NPV and SNPV and understanding the direct incremental cash flows to firm for a better NPV decision. In addition, the sustainable or ethical valuation of the externalities to stakeholders provides a more holistic valuation in SNPV with an understanding of social distance to other stakeholders.

CONCLUSION

Financial and accounting analysis using NPV and correctly identifying costs and benefits from their appropriate incremental impacts still provides a basis for sustainable decisions. However, the addition of social distance and valuation of externalities should provide a process that provides better decisions and the impact on all stakeholders. In the process of identifying social distance to stakeholders, their relative importance, and the incremental cash flows to shareholders in project analysis, the decision maker may determine when the impact is "large enough" to change the decision of project under differences between NPV and SNPV.

ENDNOTES

1. See https://www.autoweek.com/news/a2099001/ford-100-defective-pinto-almost-took-fords-reputation-it/
2. See https://www.epa.gov/environmental-economics/mortality-risk-valuation#whatisvsl

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