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## Modeling Risks in Investment Appraisal with Simple Statistical Tools

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### Abstract

This paper conducts a systematic investigation and critical evaluation of methodologies for integrating risk into investment appraisal and project planning. It underscores the premise that inadequate recognition or improper incorporation of risk factors within decision-making frameworks owing to the use of faulty models can materially undermine project viability. The desk research approach was adopted for this study using cash flow estimates relating to five sampled projects culled from the author's work archive. The projects' parameters were analyzed comparatively using discounted cash flow techniques (DCF) and risk metrics generated with Monte Carlo simulation, Mean-Relative Regression (MRR) analysis, and Enyi's simplified statistical risk model, which also generated the risk distribution pattern around the mean of the cash flows. The results revealed that in addition to the difficulty in application, there were inconsistencies in the results produced by the more sophisticated models, while the risk distribution pattern introduced by Enyi's simplified statistical risk model provides more explanatory direction for investment planning and project appraisal decision makers.

**Keywords:** Investment Appraisal, Discounted Cash Flow, Risk Modeling, Monte Carlo Simulation, DCF, Mean Relative Regression

### Introduction

Investment appraisal often represents the most challenging aspect of business decision-making. Its complexity arises from its forward-looking nature, requiring managers to navigate a wide range of natural, economic, and political uncertainties. These uncertainties translate into risks that may prevent a proposed project from achieving its full expected potential. Risk can be understood as the probability that an anticipated positive outcome may fail to materialize. Formally, ISO 31000 defines risk as the "effect of uncertainty on objectives." Within the realm of business and project proposals, disregarding this inherent uncertainty often becomes a critical factor behind project abandonment and, in severe cases, corporate insolvency.

Risk may also be described as the probability of an unforeseen negative event occurring. Uncertainty, on the other hand, reflects the absence of precise knowledge about future outcomes. In business, probability is typically derived from historical events, introduced as a means of accounting for the unpredictability of the future and preparing for unforeseen contingencies that may arise from unplanned actions.

A variety of factors can heighten risk and uncertainty in business operations, including political instability, adverse climatic changes, shifts in economic and technological conditions, demographic transitions such as population growth or aging, and evolving consumer preferences and consumption patterns.

In project appraisal, two critical types of risk must be considered: the risk of failing to realize projected cash flows and the risk of failing to achieve the broader objectives of launching the project. While these risks are interconnected, the risk of non-realization of cash flows often outweighs the risk of non-actualization of project objectives. Both are examined in detail within the model analysis section.

Distinguishing between varying degrees of risk and uncertainty highlights how probabilities are assigned based on past events. Business risk can generally be measured in two ways:

- By assigning probabilities to historical occurrences.
- By conducting market and industry analysis.

We can use tools such as the standard deviation and coefficient of variation, as well as regression analysis, to determine the risk associated with a particular distribution [1-6].

The second method of calculating risk introduced by Franco Modigliani and Merton Miller is much more complicated because it is based on the general performance of the industry in which the firm plays. In addition, firms are expected to know their own *beta* ( $\beta$ ) elements, which are the intrinsic aspects of their overall risk factor. In general terms these are systematic risk and financial risk. The systematic risk deals with how the firm is made up and the industry in which it operates. While the financial risk has to do with how the firm is funded or generally financed. This is normally associated with the leverage ratio of the firm [7].

### The need for this study

A wide range of methodologies for identifying and modeling the probability of project failure within the framework of risk assessment have been advanced in prior research. Such methods include *Risk Adjusted Discount Rate (RADR)*, *Certainty Equivalent Adjustments (CEA)*, *Scenario and Sensitivity Analysis (SASA)*, and *Probability Simulation (PS)*, otherwise known as *Monte Carlo simulation*, among others [8-10]. However, many of these approaches are characterized by considerable mathematical and computational complexity, and despite their sophistication, they frequently fall short of delivering actionable or context-specific solutions. Among the most prominent techniques is the Monte Carlo simulation, which has been extensively lauded for its capacity to incorporate stochastic variability into project evaluation. Nevertheless, its effective application presupposes a high level of mathematical proficiency that often exceeds the expertise of the average manager. Although advances in computational tools have facilitated the execution of the tens of thousands of iterative runs required by the method, the interpretive demands and the limitation of incorrect probabilistic distributions remain substantial [11].

### The Objective of the Study

Consequently, this paper proposes a streamlined, yet statistically robust, risk modeling framework designed to bridge the gap between methodological rigor and managerial accessibility. The objective is to reconcile theoretical rigor with practical applicability and to furnish decision-makers with a practical analytical instrument that enables systematic evaluation of risk exposure in newly proposed projects, thereby enhancing the reliability of investment appraisal and supporting more informed strategic choices.

### Literature Review

At its core, investment appraisal seeks to rank and select projects that are expected to generate value under conditions of uncertainty. Traditional capital budgeting frameworks are grounded in discounted cash flow (DCF) techniques, with net present value (NPV) serving as the principal metric. NPV is derived from expected cash flows discounted at the firm's cost of capital [8]. Yet, the presence of risk complicates this process, as it influences both the magnitude and timing of cash flows as well as the appropriate discount rate. Neglecting to incorporate risk into appraisal models can result in value erosion, inefficient capital allocation, and suboptimal strategic outcomes [12]. This paper advances the discourse by integrating financial theory with applied analytical techniques to construct a coherent framework for embedding risk into project appraisal.

### Risk Recognition in Business and Project Proposals

In the volatile landscape of modern commerce, the difference between a successful venture and a costly failure often hinges on risk recognition. Far from being a pessimistic exercise, identifying risks during the proposal stage of an investment is a strategic imperative that ensures resilience, investor confidence, and resource optimization.

Identifying risks allows for more accurate budgeting and contingency planning which provides for financial stewardship and business viability. Research by suggests that "optimism bias" leads many project planners to underestimate costs and overestimate benefits [13]. Rigorous risk recognition acts as a corrective lens against such cognitive biases.

Investors and decision-makers view the inclusion of a risk assessment as a sign of professional maturity. Proactive risk communication builds a "risk-aware" culture that attracts more stable capital, resulting in building stakeholders' trust and credibility [14].

Recognizing risks early allows organizations to infuse strategic agility into investment decisions and build "real options"—flexible strategies that can be adjusted as uncertainties unfold [15].

Risk recognition is not about avoiding all risks but about making "informed bets." As argued, true profit is the reward for successfully managing uninsurable uncertainty [16].

### Importance of Integrating Risk into Investment Appraisals

Risk management plays a crucial role in the success of investment projects. By identifying and assessing risks early in

the appraisal process, organizations can develop strategies to mitigate these risks and enhance the likelihood of project success. According to Graham and Harvey, ignoring risk in investment appraisals can lead to inaccurate estimations of project returns and potential financial losses [17].

Integrating risk into investment appraisals also helps organizations align their investment decisions with their risk tolerance and overall strategic objectives. This approach ensures that investments are made in line with the organization's risk appetite and long-term goals, reducing the likelihood of investing in projects that do not align with the company's values and objectives.

Adjusting for risk in project investment appraisal is essential because capital budgeting decisions are made under uncertainty, and mismeasurement of risk can lead to systematic overinvestment in risky projects and underinvestment in safer but value-creating ones. To preserve shareholder value and ensure efficient capital allocation, investment appraisal must therefore incorporate explicit risk adjustments rather than relying on naïve point estimates of cash flows or a single, arbitrary discount rate [18].

### **Concept of Risk in Investment Appraisal**

In current project appraisal practice, risk refers to the variability of actual cash flows and project outcomes around their expected values due to factors such as market volatility, technological change, regulatory shifts, and macroeconomic conditions. Uncertainty is typically reflected in the dispersion of expected net present value (NPV), internal rate of return (IRR), or other performance indicators, rather than in the mean alone, so any serious capital budgeting framework must consider both expected value and variability.

Risk in capital budgeting is often decomposed into three components: stand-alone project risk, corporate (or within-firm) risk, and market (systematic) risk. Stand-alone risk captures the variability of project cash flows in isolation; corporate risk recognizes interactions with the firm's existing portfolio; and market risk focuses on non-diversifiable risk relevant to well-diversified shareholders and is frequently measured with beta in the capital asset pricing model (CAPM).

### **Importance of Adjusting for Risk**

First, risk adjustment is necessary to avoid biased project evaluation because using expected cash flows without recognizing their dispersion systematically overstates the attractiveness of highly uncertain projects. Risk analysis techniques allow decision-makers to distinguish between projects with the same expected NPV but very different distributions of possible outcomes, making it possible to select investments consistent with the firm's risk appetite.

Second, incorporating risk explicitly improves the quality and transparency of decisions by making underlying assumptions about volatility, correlations, and probability distributions visible and testable. Stakeholders can then assess whether the project's downside risk, likelihood of loss, and probability of achieving strategic targets are acceptable relative to the capital at risk and the opportunity cost of funds.

Third, risk-adjusted appraisal helps align capital budgeting with modern finance theory by linking required returns to systematic risk and by integrating risk management into investment selection. Methods such as risk-adjusted discount rates, certainty equivalents, and simulation facilitate consistency between project evaluation, cost of capital estimation, and portfolio-level risk management practices.

Portfolio theory and equilibrium asset pricing provide the conceptual underpinning for many appraisal adjustments. Markowitz (1952) formalized diversification and trade-offs between expected return and variance. The Capital Asset Pricing Model (CAPM) links expected returns to systematic (market) risk via beta and has been used to derive risk-adjusted discount rates for project cash flows assuming market tradability or correlation with market returns. The Arbitrage Pricing Theory generalizes risk pricing to multiple factor structures [19]. These models motivate market-based risk premia but rely on assumptions (e.g., frictionless markets, representative agents) that may not hold for idiosyncratic project risks or non-traded assets.

### **Theoretical Risk Framework**

Risk is not a singular, objective reality but a multifaceted concept interpreted through various disciplinary lenses. At its core, risk involves the tension between uncertainty and human action. Modern theories of risk generally fall into three primary frameworks: rational choice, socio-cultural, and psychopolitical.

**Rational Perspective to Risk**—Historically, risk was defined purely through mathematics and probability. This approach views risk as a calculable product of the probability of an event and the magnitude of its consequences. Risk is an objective "fact" that can be managed through engineering, statistics, and economics. The *Rational Choice Theory*, first proposed by Bernoulli in 1738, suggests that individuals make decisions by weighing the expected utility of various outcomes; this position was further espoused by von Neumann and Morgenstern in 1944 [20].

**The "Risk Society" and Reflexive Modernity** perspectives to risk which were sparked off by the contributions of Ulrich Beck in 1992 and respectively, revolutionized the field by arguing that modern society is defined by "manufactured

risks”—hazards created by technological and industrial progress (e.g., climate change, nuclear energy) [21]. The theory states that unlike the “natural” risks of the past (famine, plague), modern risks are global, invisible, and irreversible. Beck suggests that we have moved from a society concerned with distributing wealth to one concerned with distributing risks. Giddens’ Reflexive Modernity on the other hand, suggests that as we produce more knowledge, we simultaneously produce more uncertainty, leading to a constant state of societal anxiety [21,22].

Still on the socio-cultural perspective, proposed by Douglas and Wildavsky in 1982, is a collective construct [23]. What a society chooses to fear says more about its social structure than the actual danger. This birthed the *Cultural Theory of Risk*, whose framework categorizes how different social groups perceive risk based on their “grid” (rules) and “group” (cohesion). For example, “egalitarians” tend to be more concerned with environmental risks, while “individualists” may fear government intervention more than the market’s volatility [23].

*Psychopolitical theory of risk* is an attempt to connect governmentality and “risk as analysis.” Drawing on Michel Foucault’s work, scholars like view risk as a tool of governance [24]. By labeling certain behaviors as “high risk,” institutions can regulate populations and encourage individuals to monitor their own health, finances, and safety.

### Materials and Methods

The desk checking approach was adopted for this study. Cash flow estimates relating to five proposed projects worked on by the author were used in a comparative investment appraisal and risk ascertainment. The discounted cash flow techniques and metrics were employed to measure the viability of the projects while the risks associated with the projects were computed using three techniques – Monte Carlo simulation, Mean-Relative Regression (MRR) analysis, and Enyi’s simplified statistical risk model. MRR allows for comprehensive and flexible evaluations of covariate effects on a survival cash flow of interest while providing simple physical interpretations on the time scale. Also, MRR based analysis like quantile regression methods enjoy easy and stable computation [5].

### Model Formulation:

Let

- m = mean cash flow
- $a_t$  = annual cash flow for time  $t$ .
- $p_t$  = probability of cash flow ( $a_t$ ) occurring
- prs = project realization risk
- rv = risk associated with loss of money value (purchasing power)
- cs = project chance of success
- td = total discounted cash flow of all estimates and residual value
- tu = total undiscounted cash flow of all estimates and residual value
- ocs = over all chance of project success
- ha = highest annual cash flow
- $pa_t = \hat{y}$  = predicted annual cash flow for time  $t$ .
- mrr\_risk = Mean relative regression risk
- RSS = residual sum of squares
- TSS = total sum of squares
- e = residual

With MRR, the annual cash flow projections become the predictor variable while the outcome variable is computed using some of the following formula:

$$m = (\sum_t^n at) / n \tag{1}$$

$$pa_t = a_t((a_t - m)/m) + a_t \tag{2}$$

$$mrr\_risk = \frac{RSS}{TSS} \tag{3}$$

$$TSS = (y - \bar{y}1)^T(y - \bar{y}1) \tag{4}$$

$$e = y - \hat{y} \tag{5}$$

$$RSS = e^T e \tag{6}$$

$$rv = 100 - \left\{ \left( \frac{1 - td}{tu} \right) 100 \right\} \tag{7}$$

$$\text{prs} = \{\sqrt{\sum(p_i(a_i - m)^2)}\} / m \quad (8)$$

$$\text{cs} = 100 - \text{rv} \quad (9)$$

$$\text{ocs} = \text{cs}(1 - \text{prs}) \quad (10)$$

To model the risk with Enyi's simplified risk model, we determine the coefficient of variations of each project by calculating the standard deviation of the cash flow distribution and divide the value with the mean cash flow. Furthermore, we analyze the distribution of the risk around the mean of the cash flow to ascertain the direction of the associated project risks and rank the projects accordingly. Monte Carlo simulations and the MRR analyses were performed using ValuStats (VSP) version 2.0.

#### 4.0 Statistical Risk Modeling

Statistical risk modeling is an attempt to break down the risk metrics associated with projects to enable better and full understanding of all elements and directions of the risks

Stream	Project 1		Project 2		Project 3		Project 4		Project 5	
S/N	VALUE	F	VALUE	F	VALUE	F	VALUE	F	VALUE	F
1	45000	3	2000	2	3000	2	2500	3	55	17
2	50000	3	3000	3	3500	4	3000	3	155	15
3	55000	6	4000	5	4000	8	3500	7	255	11
4	60000	5	5000	5	4500	4	4200	4	355	14
5	65000	3	6000	5	5000	2	5500	3	455	12
6									555	6
7									655	5
8									755	9
9									855	7
10									955	8
Mean	55000	20	4000	20	4000	20	3715		418.5	104
Std. Dv	6305		1280.63		547.72		916.12		289.25	
Co-Var	11.36		29.11		13.69		24.66		69.12	

**Table 1: Cash Flow Listing for 5 Projects**

Cash flow	Project 1	Project 2	Project 3	Project 4	Project 5
Highest Value	65000	6000	5000	5500	955
Upper Risk Deviation	3695	319.37	452.28	868.88	247.25
Upper Limit Value	61305	5680.63	4547.72	4631.12	707.75
Mean	55000	4400	4000	3715	418.5
Lower Limit Value	48695	3119.37	3452.28	2798.88	129.25
Lower Risk Deviation	3695	1119.37	452.28	298.88	74.25
Lowest Value	45000	2000	3000	2500	55
Standard Deviation	6305	1280.63	547.72	916.12	289.25
Risk level	11.36	29.11	13.69	24.66	69.12
Total Risk deviation	7380	1438.74	904.56	1167.76	321.50
Top limit risk	5.68 (50%)	6.46 (22.2%)	6.845 (50%)	18.35 (74.4%)	53.16 (76.9%)
Bottom limit risk	5.68 (50%)	22.65 (77.8%)	6.845 (50%)	6.31 (25.6%)	15.96 (23.1%)
Risk characteristic	Even	Bottom-heavy	Even	Top-heavy	Top-heavy

**Table 2: Project Risk Distribution Analysis**

Applying the MRR regression method (details outside this paper) indicated that the risks associated with the projects are 9.8%, 8.2%, 7.4%, 21.3%, and 27.75%, respectively.

## Inter-Phasing Cash Flow Realization Risk with Project Actualization

The stage of analyzing cash flow realization risk precedes the main project actualization analysis, which we call the investment appraisal stage. Given that the use of the discounted cash flow technique (DCF) is a universal and more scientific method of appraising intended projects with the risk of falling value of money removed, the major concern for most DCF valuations is how to authenticate the metrics with which investment decisions are taken. The major questions remain: Can we take these projected figures to the bank? In other words, how accurate could the metrics be in achieving our objectives? Have we considered all possible impediments and uncertainties that could derail our objectives of proposing the project? Have we taken care to address all grey areas highlighted as risks?

To model a full risk-encompassing project analysis, it is important to integrate the cash flow realization risk analysis with the project actualization risk analysis. To understand project actualization risk analysis, we illustrate a DCF analysis on the following case-study project:

Project cost: \$200,000 (Zero residual value)

Project life: 10 years

Discount factor applicable: 17.5%

Cash flow projections: 22,000; 34,000; 47,500; 58,000; 68,500; 79,000; 92,000; 102,000; 112,000; and 120,000

### Solution to Case-Study Project

To proceed, we determine the cash flow realization risk using a *mean* cash flow of \$73,500 with a standard deviation of \$31,595.89 to arrive at the project co-variation metric of 42.99 (approximately 43%). Meaning that the risk associated with the full realization of the cash flow projections is 43%, which is considered high. However, to understand the full implication of this risk figure, we need to examine how the risk is distributed around the mean as follows:

Highest cash flow projection	120,000.00
Lowest cash flow projection	22,000.00
Upper limit value (73,500 + 31,595.89)	105,095.89
Lower limit value (73,500 – 31,595.89)	41,904.11
Upper risk deviation (120,000 – 105,095.89)	14,904.11
Lower risk deviation (41,904.11 – 22,000)	19,904.11
Total risk deviation (14,904.11 + 19,904.11)	34,808.22
Top limit risk (14,904.11/34,808.22 x 43%)	18.4% or 42.8% of total risk
Bottom limit risk (19,904.11/34,808.22 x 43%)	24.6% or 57.2% of total risk

The preceding analysis showed that the risk distribution around the mean is *bottom-heavy*, implying that the project is more likely to attain the maximum cash flow of \$120,000 than to descend to the lowest value of \$22,000.

### DCF Analysis of the Projections

With the assumption that the process of project appraisal using the DCF is familiar and out of the scope of this paper, the following metrics were derived from the DCF analysis:

Total discounted cash flows (*td*) = \$271,643.05

Total un-discounted cash flows (*tu*) = \$735,000

The Net Present Value (NPV) of the project using 17.5% discounting factor = \$71,643.05

The alternate NPV using 22.5% = \$16,562.95

The internal rate of return (IRR) established is 24%.

### Analyzing Project Actualization Risk.

Having earlier computed the risk associated with the realization of the cash flow projections, we proceed to calculate the time-based loss of purchasing power of money and the risk associated with the probability of not actualizing the projected cash flow streams. To measure the risk of loss of purchasing power of money, we compare the total value of the discounted cash flows over the period of investment with the total value of the undiscounted cash flows by dividing the latter by the former and removing the value from 1. This method is given by the *rv* formula (equation 7).

For the project under review, *td* = 271,643.05 while *tu* = 735,000.

Risk of loss of purchasing power (*rv*) =  $100 - \left[ \frac{(1 - 271,643.05)/735,000}{1} \times 100 \right] = 36.96\%$

Project chance of success (*cs*) =  $(100 - rv) = 100 - 36.96\% = 63.04\%$

With the risk associated with loss of money value at 36.96% and chance of realizing the project at 63.04%, we combine the latter with the risk of project realization (43% or 0.43 calculated earlier) to arrive at the overall risk profile for the project. Thus, the overall chance of success becomes:

$$ocs = 0.6304 * (1 - 0.43) = 0.3593 \text{ Or } 35.93\%$$

Therefore, the overall risk for the project =  $100 - 35.93 = 64.06\%$ . To interpret this literally, it is an indication that the

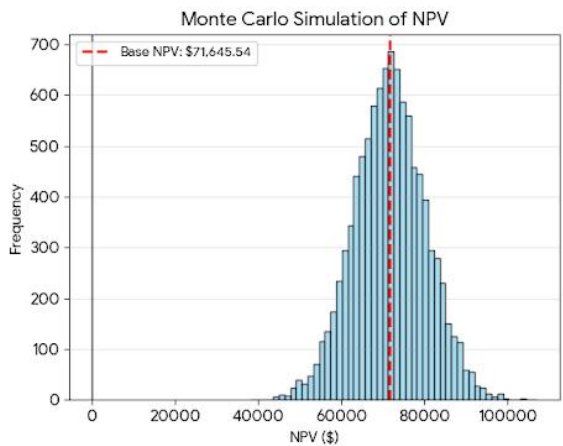
project will achieve a 35.93% success in realizing the actual value of the cash flow projections in today's money value when the effect of inflation and other actualization risk factors are considered. In essence, the risk-adjusted discount rate with this method lies between the base discount rate of 17.5% adjusted for chance of success and the same rate adjusted for chance of failure (that is, between  $17.5\% * 1.3593 = 23.8\%$  and  $17.5\% * 1.6406 = 28.7\%$ ). Fortunately, the lower threshold rate of 23.8 still falls below the IRR of 24%, (the breakeven rate). Ignoring the higher limit rate of 28.7%, it would be safe to conclude that the project has a fair chance of success using the current projected income streams. More information could be garnered from the following summary:

Metric	Value
Risk of loss of purchasing power	36.96%
Mean of Cash Flow	\$73,500
Standard Deviation	\$31,595.89
Coefficient of Variation	43%
Chance of Success	63.04%
Risk-adjusted Chance of Success	35.93%
Overall Project Risk (100 – 35.93)	64.07%
Risk-adjusted discount range	23.8% - 28.7%
Net Present Value (NPV)	\$71,643.05
Internal Rate of Return (IRR)	24%
Allowable Risk Premium (24–17.5)	6.5%
% of Allowable Risk Premium	$6.5/(28.7-17.5) = 58.04\%$

**Summary of the Project Risk Analysis:**

**Monte Carlo Risk Analysis**

To assess the risk in the case-study project, a Monte Carlo (MC) simulation was performed on the same project cash flow stream with 10,000 iterations. For each iteration, the annual cash flows were modeled using a normal distribution with a standard deviation of 10% to account for potential variability. Simulation results include a mean NPV of \$71,658.66 and a probability of NPV > 0 of 100% using the base rate of 17.5% and continuing to the rate of 24.38%, which is the MC model's breakeven rate. By implication, the MC model suggested a risk premium of 11.52% as the most appropriate.



Source: ValuStats (VSP) 2.0

**Figure 1: Monte Carlo Risk Simulation Chart**

**Discussion**

From tables 1 and 2, it can be observed that project1 and project 3 have their risk of cash flow realization spread evenly around the mean projection, while project 2 has the risk of not attaining the lowest cash flow projection higher at 22.65 of the 29.11 total, implying that it will be more difficult for the project to fall below the lower cash flow realization threshold of 3119.37. However, that is not the case with projects 4 and 5, which have their risks of attaining the highest projection higher than that of going below. The implication is that projects 1, 2, and 3 would be preferred to projects 4 and 5 because it would be easier to attain higher cash flow projections with them than the latter two, which have the propensity to reach for lower projections faster than for higher levels. Project 2 particularly looks more viable than all others because it has only a 22.2% risk of not attaining the highest amount as against the 50% risk for both projects 1 and 2. Even worse are the risk positions of projects 4 and 5, which carry more than 70% risk of not attaining the highest cash flow projection. With project4 at 74.4% and project5 at 76.9% risks of not attaining the highest value, they are

said to be top-heavy, while project2 could be classified as a *bottom-heavy* risk project. Analyzing the distribution of risks around the mean of the cash flow projections will enable managers of projects to take the most viable investment decision that could effectively enhance the economic position of an entity. This is the essence of statistical risk modeling.

The case-study project analysis revealed that the required risk premium that satisfies the risk inherent in the proposed project is 28.7 – 17.5, which equals 11.5%, but given that the project IRR (the breakeven rate) is 24%, it implies that only 6.5, or 58.04%, of the required risk premium could be accommodated as an addition to the present 17.5% discount rate. Furthermore, introducing a risk premium to aid the objective appraisal of a discounted cash flow analysis can be useful as a wedge against failure, but it must be based on a phased consideration, as excessive inclusion of an unrealistic risk premium could lead to the rejection of an otherwise viable project. With the suggested simplified risk method approach given in the preceding analyses, the overall risk premium computed is 11.5%, which is slightly below the 11.52% suggested under the Monte Carlo method.

A comparison of the three risk modeling methods revealed that the three models applied have somewhat divergent results in the risk figures produced. While the Monte Carlo simulation tends to produce values somewhat like Enyi's simplified statistical risk model, the mean relative regression (MRR) differs, though it was able to point out those projects with higher risks but not with expected precision. Table 3 shows more.

Model	Project 1	Project 2	Project 3	Project 4	Project 5
Monte Carlo	13%	24%	12.5%	25.1%	48%
MRR	9.8%	8.2%	7.4%	21.3%	27.75%
Enyi's model	11.36%	29.11%	13.69%	24.66%	69.12%

**Table 3: Comparison of Risk figures by model**

### Conclusion

Recognition and application of risk are important in investment planning and project proposal and execution. Ignoring the element of risk in investment planning is like flying an airplane without a compass. Likewise, using the wrong risk metric is even more dangerous than ignoring it because, as posited by Dixit and Pindyck it is a recipe for disaster for an investor who might be convinced by a spurious risk metric to either invest when it is not safe or ignore a safe and profitable investment opportunity [12]. The Enyi's simplified statistical risk model not only offers an easy-to-apply formula, but it does so with the additional value of knowing how the risk is distributed within the range of the given cash flow projections.

**Ethical Approval and Consent to Participate:** This research did not involve any human or animal subjects. The study exclusively utilized available investment cash flow projections used for tutorial purposes only. According to the "Babcock University Health, Research and Ethics Committee (BUHREC)" guidelines, research using archive documents is exempt from ethical scrutiny that applies to studies involving direct contact with humans or animals.

**Consent for Publication:** No personalized details, images, or videos of any individuals were used in the preparation of this document; thus, no consent for publication is required.

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**Conflict of Interest:** The author has no conflict of interest to declare.

**Declaration of Generative AI and AI-Assisted Technologies:** This study has not used any generative AI tools or technologies in the preparation of this manuscript.

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