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Article

Equity-based Financing and Credit Risk: A Monte Carlo Analysis of Economic Crises in Malaysia

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***Abstract*— Financial instruments play a critical role in influencing the performance of a corporation. Corporate management may choose between debt and equity-based financing instruments to ensure the continuity of their business operations. Even so, the management will need to consider the credit risk exposure associated with the financing instruments as they tend to affect corporate performance, especially during an economic fluctuation. Therefore, this study employed Monte Carlo simulation to analyze and compare the credit risk exposure associated with debt and equity-based financing across various sectors in Malaysia, particularly in the context of significant economic crises. The sectoral data were used and segregated into two different phases of economic crises, which are from 2007 until 2018 (this period involves the Global Financial Crisis (GFC)) and from 2010 until 2021 (this period involves the COVID-19 pandemic). Through the simulation, this study finds that equity-based financing recorded consistent results of providing low credit risk exposure regardless of sectors and economic crises. Meanwhile, debt financing recorded high credit risk by all sectors during the economic crises. Therefore, this study suggests that equity-based financing is more reliable than debt in promoting corporate financial sustainability by offering lower exposure to credit risk and minimizing reliance on debt issuance.**

***Keywords*— Equity-based financing; Debt financing; Credit risk; Monte Carlo; Economic Crises.**

I. INTRODUCTION

Corporate credit risk often called the risk of a company failing to meet its financial obligations, is a critical concern that directly impacts corporate financing decisions [5]. The responsibility for managing and mitigating this risk rests with the company's management, as effective risk management ensures financial stability and operational continuity. To run a project, a company needs capital to finance the operation and can choose between debt and equity-based. When a company chooses debt financing for its project, credit risk becomes more pronounced. This is because debt financing requires fixed interest payments and the eventual repayment of the principal, regardless of the company's financial performance [19]. During periods of economic instability, meeting these obligations can strain a company's financial resources, increasing the likelihood of default. In severe cases, such financial distress can escalate into bankruptcy, underscoring the importance of prudent risk assessment and management strategies.

The Global Financial Crisis (GFC) of 2007-2008 underscored the dangers of excessive debt financing, which emerged as a central factor behind the worldwide economic downturn [8]. Many companies burdened by high pre-crisis debt, faced elevated credit risk and struggled to meet their

financial obligations during the economic slump, often risking default and potential legal consequences. According to [12], higher financial leverage is generally associated with lower investment levels, as increased debt obligations can constrain a firm's financial flexibility. However, this relationship can shift under certain conditions. For firms with very low initial debt levels, increasing debt may stimulate investment by providing the necessary capital to fund growth opportunities. This nuanced dynamic underscores the variability in the impact of debt on investment, highlighting that the relationship is influenced by a company's initial debt position and financial circumstances. Insights from the GFC further demonstrate how the interplay between debt and investment can differ significantly across firms, emphasizing the importance of context in financial decision-making.

The recent economic crisis triggered by the coronavirus disease 2019 (COVID-19) has pushed the global economy to the brink. Businesses across the globe are grappling with severe financial repercussions due to pandemic-induced lockdown measures, making survival increasingly challenging for many. The economic impact of COVID-19 has been uneven across industries, with some sectors suffering disproportionately. Economic experts have highlighted the excessive reliance on debt financing and the shifting of associated risks as central contributors to the global crisis. Regardless of warnings about its potential threat to the financial system, 14 prominent European countries reported record-high debt levels at the start of 2020. In addition, ongoing and anticipated increases in corporate debt to address the pandemic's economic fallout further exacerbate the problem. The sharp decline in the book value of equity-based caused by the pandemic has had immediate implications for companies' leverage ratios, with increases ranging from 6.7% to 8% compared to a business-as-usual scenario [12]. Across the pre-crisis distribution of leverage, the pandemic has significantly shifted companies toward extremely high leverage ratios, raising concerns about large-scale over-indebtedness. This potential corporate debt overhang is further intensified by heightened default risks and elevated levels of indebtedness. Such conditions could stifle investment, slow economic recovery, and perpetuate financial instability. Excessive leveraging also increases the likelihood of defaults, endangering the stability of the entire financial system. The urgency of addressing this critical issue cannot be overstated, as unchecked leverage growth poses systemic risks that could undermine long-term economic recovery.

In the wake of financial crises, policymakers and economists continue to seek strategies to reduce debt within the financial system. Their ultimate aim is to manage and mitigate credit risk exposure, which tends to escalate during periods of economic volatility. Effective credit risk management is critical for preventing corporate failures and ensuring the sustainable growth of the broader economy. This approach is essential for controlling the proliferation of credit risks within the financial system [4]. From a sustainability perspective, the [26] marked a pivotal moment where leading scholars and experts advocated for integrating risk-sharing mechanisms into the financial system through equity-based financing [47]. This agenda emerged from an analysis of the GFC from 2007 to 2008, during which the Islamic financial system demonstrated resilience. By relying on real asset claims, the system effectively absorbed financial shocks and exhibited a lower vulnerability to default [32].

Real asset claims, which epitomize equity-based financing, have since garnered attention for their potential to create long-term sustainable value [19]. However, despite its advantages, adopting equity-based financing and risk-sharing mechanisms remains limited. Awareness of the risks posed by excessive reliance on debt which amplifies credit risk has not significantly shifted financial preferences. Over the years, debt levels have continued to rise. Nearly a decade after the global crisis, efforts to reduce the financial system's dependence on debt-based instruments appear to have made little progress. Between 2008 and 2023, global corporate debt experienced a sharp increase, with the total outstanding amount of corporate bonds reaching USD 34 trillion, a real increase of USD 13 trillion since 2008 [35]. These statistics underscore the persistent preference for debt in the financial system, raising serious concerns about its implications for sustainable economic well-being. In response to these challenges, this study employs a quantitative approach to compare the credit exposure of debt and equity-based financing across several sectors in Malaysia. The analysis highlights the potential of equity-based financing to reduce credit risk and enhance corporate financial sustainability, particularly during economic downturns.

II. LITERATURE REVIEW

Over the years concerns have grown among economists and policymakers regarding increased debt issuance and its implications for corporate credit risk. Debt financing involves fixed and scheduled repayments of interest and principal, irrespective of the company's financial performance. This rigid structure can burden companies, especially during economic downturns, potentially leading to default or bankruptcy [9], [42].

A. Debt Financing and Its Impact on Credit Risk

Debt financing significantly affects corporate credit risk by introducing fixed repayment obligations that increase financial strain, especially during economic downturns. Adding debt to a corporation's capital structure raises stockholder risk, affecting earnings and increasing the probability of deficits [6], while commercial credit financing exhibits a U-shaped effect on corporate risk-taking, where low levels suppress risk-taking and high levels encourage it, highlighting its dual impact [46]. Leverage volatility further exacerbates credit risk by influencing corporate bond pricing and credit spreads [15], while financial mismatches, particularly in firms with limited government support, lead to inefficient investments and heightened default risk [36].

The risks associated with debt financing are amplified by liquidity deterioration in debt markets, which increases rollover risk and widens credit spreads [20], and by shadow banking financing, which contributes to higher bond credit spreads, particularly in less profitable regions and among non-state-owned enterprises [27]. Banking instability further complicates debt financing by raising costs and forcing firms to substitute trade credit, increasing credit risk for firms closely tied to banks or operating during macroeconomic shocks [22]. Additionally, higher short-term debt ratios elevate default risk due to

liquidity constraints, emphasizing the challenges of managing debt exposure effectively [29].

In summary, debt financing introduces significant credit risk through its fixed obligations, leverage volatility, financial mismatches, and external market uncertainties, underscoring the need for prudent risk management to mitigate its adverse effects on corporate financial stability.

B. Economic Crises and the Amplification of Debt Risk

Economic crises, such as the GFC of 2007–2008 and the COVID-19 pandemic, have underscored the vulnerabilities of debt financing in exacerbating corporate credit risk. The GFC, triggered by excessive leverage in the subprime mortgage market, highlighted systemic failures in risk management, including overconfidence among creditors, misjudgments by rating agencies, and inadequate regulatory oversight [17], [31]. These factors led to constrained corporate investments, widespread defaults, and a prolonged economic slowdown [12], [25].

During the COVID-19 pandemic, companies increasingly relied on debt to address liquidity shortages caused by government-imposed lockdowns and economic disruptions. While debt financing provided immediate relief, fixed repayment obligations heightened default risks as revenues declined [16]. This dual effect highlights the limitations of debt financing during periods of economic instability, particularly when liquidity constraints and high leverage ratios amplify financial distress.

The risks associated with debt financing during crises are compounded by market dynamics. Liquidity deterioration in debt markets increases rollover risk, leading to higher default probabilities and wider credit spreads [20]. Shadow banking financing further intensifies these risks, as its expansion contributes to higher bond credit spreads, especially in financially weaker regions and among non-state-owned enterprises [27]. Moreover, firms heavily reliant on bank financing face heightened credit risks during banking uncertainties, as rising costs prompt a shift to alternative financing methods such as trade credit, which further destabilizes financial stability [22].

In other words, economic crises amplify the inherent vulnerabilities of debt financing, demonstrating the need for alternative financial structures that can absorb shocks and reduce systemic risks. The reliance on debt during crises underscores the importance of exploring flexible and sustainable financing mechanisms, such as equity-based financing, to enhance corporate resilience.

C. Equity-based Financing: A Resilient Alternative

Equity-based financing has emerged as a viable alternative to debt financing, offering a flexible, risk-sharing mechanism that mitigates credit risk and promotes financial sustainability. Unlike debt, equity-based financing aligns returns with corporate performance, eliminating fixed repayment obligations and allowing companies to better manage financial challenges during economic downturns [13], [43]. This adaptability reduces the likelihood of default and ensures that financial distress does not spiral into insolvency.

Various equity-based-like instruments, such as GDP-linked bonds, Sukuk, and profit-and-loss sharing (PLS) models, have been proposed as sustainable financing solutions. GDP-linked bonds, for instance, act as automatic stabilizers by smoothing taxation during economic cycles and promoting global risk-sharing [10], [41]. Similarly, Sukuk and PLS models emphasize shared risk and performance-based returns, providing companies with more financial flexibility and lowering credit risk [45]. Empirical evidence supports the efficacy of PLS financing, particularly in Islamic banking, where banks directly engage in customer investments to manage risks effectively [14].

Equity-based financing also fosters economic stability by reducing dependence on debt. Equity-based financing minimizes speculation and systemic vulnerabilities by tying returns to real economic activities, making it a cornerstone of a more sustainable financial system [13], [37]. Additionally, its ability to share risk between investors and companies makes it particularly valuable during economic crises, when traditional debt instruments exacerbate financial strain.

To sum up, equity-based financing offers a resilient alternative to debt financing by providing risk-sharing benefits, aligning returns with performance, and reducing systemic vulnerabilities. These attributes position equity-based financing as a key mechanism for enhancing corporate resilience and fostering long-term financial sustainability. Figure 1 below demonstrates the summary of the overall concept of this study.

III. METHODOLOGY

This study employs Monte Carlo simulation to analyze and compare credit risk exposure associated with debt and equity-based financing during periods of economic crisis [44]. Sectoral price index data from four selected sectors were used to evaluate credit risk exposure across two distinct crisis periods: the GFC (2007-2018) and the COVID-19 pandemic (2010-2021). These periods were chosen because of their comparable impacts on corporate financing due to similar economic disruptions. The sectors analyzed – consumer products, industrial products, healthcare, and technology, were selected based on their significant vulnerability during these crises [38]. Monthly price index data for these sectors were sourced from Thomson Reuters [39] and simulated using Microsoft Excel [17]. This approach allowed for a detailed comparison of credit risk exposure under debt and equity-based financing during major economic downturns. By examining these two periods, this study aims to highlight the potential of equity-based financing to consistently mitigate corporate credit risk exposure and promote financial sustainability. These findings are expected to demonstrate that equity-based financing offers a stable advantage in reducing credit risk across diverse sectors, even during significant economic events.

After gathering the historical price index data for the four selected sectors, this study categorizes the data into two distinct economic phases: the period encompassing the GFC and the period impacted by the COVID-19 pandemic. To conduct the simulation, the study follows a series of steps, as outlined below:

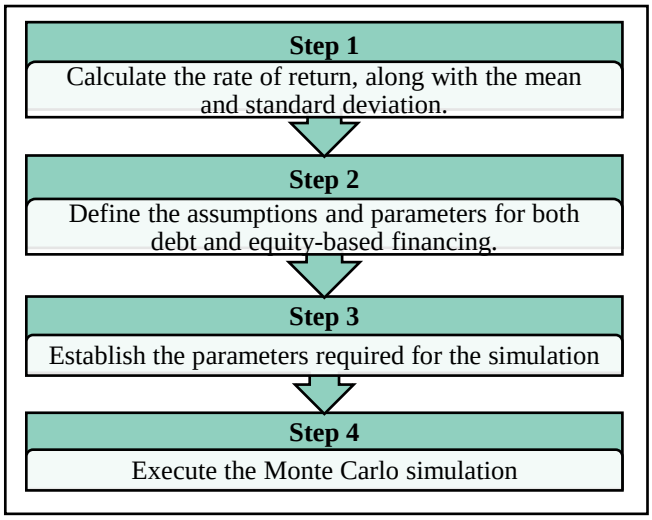

Figure 1. The steps of the simulation

Based on Figure 1 above, this study provides a detailed explanation of the process, covering all inputs and elements involved in each step, to simulate credit risk exposure in debt and equity-based financing across the two distinct economic phases.

Step 1: Calculate the rate of return, mean, and standard deviation of the price index data.

The simulation in this study began by calculating the rate of return using sectoral price index data. As defined by [23], the rate of return represents the percentage change in an investment's value relative to its initial cost. To determine the rate of return, this study incorporates the net profit or loss generated by an investment over a specified period. The calculation follows the formula outlined below to compute a company's rate of return [1].

$$Rate\ of\ return = \frac{(Initial\ price\ index - Final\ price\ index)}{Initial\ price\ index} \times 100\% \quad (1)$$

Following that, this study calculates the mean and standard deviation, which represent the expected return and the risk associated with the company's investment, respectively. The expected return reflects the potential gain or loss an investor could experience based on historical returns and the likelihood of specific outcomes under various scenarios. In contrast, the standard deviation serves as a measure of risk, quantifying the degree of variation or dispersion around the mean [1]. Theoretically, higher risks correspond to greater fluctuations in the expected return. The formula for the mean, representing the company's expected return, is provided below [23].

$$Mean, \bar{R} = \frac{\sum R}{N} \quad (2)$$

Where,
$\sum$ R = Sum of the periodic historical data
N = Total number of observations period

The formula for the standard deviation, which quantifies the risk associated with the return, is presented below [1].

$$Standard\ deviation, \sigma = \sqrt{\frac{\sum (R_i - \bar{R})^2}{N}} \quad (3)$$

Where,
R_i = Periodic historical data
$\bar{R}$ = Average periodic historical data
N = Total number of observations period

Step 2: Define the assumptions and parameters for both debt and equity-based financing.

After calculating the variables outlined in Step 1, this study establishes the assumptions and parameters for debt and equity-based financing. For debt financing, it is assumed that the return to the investor is fixed, while the company retains the residual income. However, the fixed payment obligation associated with debt issuance can impose a financial burden on the company, increasing the likelihood of default and exposing it to credit risk. In some cases, the trade-off theory may justify the use of debt due to its potential benefits, such as tax shields. Nevertheless, prolonged high exposure to credit risk can lead to financial distress or even bankruptcy. Elevated credit risk also reduces the company's ability to withstand economic crises.

In contrast, equity-based financing assumes that returns to both the investor and the company are determined by a profit-sharing ratio. If the company does not generate a profit, it is not obligated to provide a return to investors. This flexibility in equity-based financing can help mitigate the company's credit risk exposure. However, unlike in debt financing, the absence of guaranteed returns may deter investors from committing to the project, as they must forgo the security of fixed returns.

To conduct the simulation, this study set several essential debt and equity-based financing parameters to form the financing scenario. The parameters used are summarised in Table I below.

TABLE I. COMPARISON IN THE PARAMETERS FOR DEBT AND EQUITY-BASED FINANCING

Debt Financing	Parameters	Equity-based Financing
RM1,000,000	Initial Capital	RM1,000,000
5% (coupon rate) = RM50,000	Return to the Investor	Profit-sharing ratio = 70%
Residual return	Return to the Company	Profit-sharing ratio = 30%
Annually	Frequency of Payment	Annually
12 years (period involves GFC) & 12 years (period involves COVID-19)	Duration of Project	12 years (period involves GFC) & 12 years (period involves COVID-19)

Table I outlines the parameters used in this study, which highlight the comparison between debt and equity-based financing for a hypothetical project. The study assumes a project cost of RM1,000,000, financed either through debt or equity-based. In the case of debt financing, the investor receives a fixed annual coupon payment of 5%, equivalent to RM50,000, while the remaining profit after this payment accrues to the company. Additionally, the investor is repaid the principal amount of RM1,000,000 at the end of the maturity period. For equity-based financing, returns to both the investor and the company are tied to the project's financial performance. Profits are shared in a 70:30 ratio, with the investor receiving 70% and the company retaining the

remaining 30%. This profit-sharing ratio adheres to the guidelines specified in the revenue-sharing plan [40]. If the project fails to generate a profit, the investor does not receive any returns, nor are these considered deferred returns for future periods. This arrangement ensures that the project's risks are distributed equitably between the investor and the company. In both financing methods, annual payments are made to the investor and the company. The study divides the project's timeline into two distinct phases: a 12-year period covering the GFC event and a subsequent 12-year period covering the COVID-19 pandemic.

This study utilized the above parameters to analyze the simulated risk and return outcomes of equity-based and debt financing. The expected return in each sector serves as a key indicator of its performance over a defined timeframe. A higher expected return reflects strong project performance and success, signifying the ability to generate consistent returns for investors. Conversely, a lower expected return highlights underperformance, potentially hindering the project's capacity to sustain regular investor returns.

Step 3: Establish the parameters required for the simulation.

Simulation involves replicating the dynamic behavior of a real-world process or system, providing valuable insights into its complexities, as highlighted by [28]. In a prior study by [44], a Monte Carlo simulation was employed to model credit risk exposure associated with debt and equity-based financing. This analysis conducted using Microsoft Excel software [17], offered a deeper understanding of risk and return for both investors and companies. Monte Carlo simulation as described by [17], is a powerful tool for demonstrating the effects of risk and uncertainty on forecasting and predictive models. Furthermore, [30] defined the Monte Carlo method as a mathematical approach that estimates potential outcomes in uncertain conditions, making it widely applicable across diverse fields.

Previous studies have leveraged this method to achieve optimal results tailored to specific objectives. For instance, [21] integrated Monte Carlo simulation with Brownian Motion to compute the Value at Risk (VaR). By incorporating an adjustment coefficient, the study attained the most accurate VaR estimates, effectively quantifying the maximum expected loss with a high degree of confidence. This finding underscores the method's utility in robust risk assessment and optimal loss estimation under uncertainty.

The parameters defined in Step 2 were used to perform a Monte Carlo simulation, modelling returns for both the investors and the company. The simulation consisted of 5,000 iterations [34], with the company's annual returns fluctuating within the range of the mean and standard deviation calculated in Step 1. Key metrics were derived after the iterations, including the frequency of negative returns, negative net present value (NPV), and default events. The frequency of negative returns reflects the likelihood of the company earning little or no return from the project. The frequency of negative NPV indicates the extent to which the financing adds or detracts from the company's value. Meanwhile, the default frequency measures the probability of the company failing to meet its debt obligations, representing credit risk as outlined in Step 2. Default occurs when the company cannot meet fixed debt payments, a risk mitigated by equity-based financing, which offers flexible payment terms and tolerates zero investor returns in periods of negative profit. The frequency of negative NPV also highlights the value of equity-based financing over the financing period, capturing its potential to support the company during periods of financial strain.

Step 4: Execute the Monte Carlo simulation.

This study adheres to the method outlined by [17] to conduct the simulation. The detailed parameters and procedures are presented below.

1) Initial Data Input: The simulation begins with essential inputs, including a capital requirement of RM1,000,000; the rate of return; the mean and standard deviation of historical price index data; a 5% annual return for debt financing; a pre-agreed profit-sharing ratio of 70% for investors and 30% for the company in equity-based financing; and a 3% discount rate to calculate the net present value (NPV).

2) Simulation Period: Monthly price index returns are simulated for two periods, a 12-year span encompassing the GFC and a 12-year span covering the COVID-19 pandemic.

3) Annualized Returns: The annualized returns for the 12-year and 12-year periods are calculated to ensure consistency in the measurement and comparison of results.

4) Investor and Company Returns: The returns for both investors and the company are determined for the 12-year period involving the GFC and the 12-year period covering the COVID-19 pandemic.

5) Debt Financing Analysis: For debt financing, the fixed interest paid to investors is calculated at a 5% annual rate, equivalent to RM50,000 per year. The residual value retained by the company is derived by subtracting the investor's annual payment from the initial capital.

6) Equity-based Financing Analysis: For equity-based financing, a profit-sharing ratio is allocated to investors, while the company retains 30% annually. If the company generates no profit in a given year, investors receive no returns, reducing the company's credit risk but potentially lowering investor satisfaction.

7) Discounted Cash Flow and NPV: The discounted cash flow for investors is calculated annually using a consistent discount rate of 3%. The NPV for investors is then computed based on these cash flows. Negative NPVs are analysed to assess their frequency, offering insights into the financial benefits for investors. A negative NPV indicates no increase in investor's investment value.

8) Negative Return Analysis: The likelihood of the company incurring financial losses is determined by analyzing how often the simulated monthly returns are negative, leading to insufficient profits.

9) Credit Risk Assessment: The probability of company default is evaluated, particularly in scenarios where the company cannot generate profit yet remains obligated to pay a 5% return to investors.

10) Simulation Iterations: This study simulates 5000 scenarios to estimate the frequency of negative NPV, negative returns for the company, and default risks. This iterative process provides a comprehensive understanding of potential outcomes under varying conditions.

IV. RESULT AND DISCUSSION

This study examines the risk and return dynamics of equity-based and debt financing across four selected sectors during two distinct economic phases. The analysis spans two observation periods: 2007-2018, encompassing the GFC, and 2010-2021, covering the COVID-19 pandemic. Employing the steps outlined in the methodology, this study leverages Monte Carlo simulation to model various crisis scenarios. This approach evaluates the capacity of equity-based financing to support financial sustainability in these sectors, irrespective of prevailing economic conditions.

A. The phase of involving GFC (2007-2018)

Tables II-V provide a comprehensive analysis of the risk and return associated with debt and equity-based financing during the period encompassing the GFC. These tables provide insights into the expected returns and risks for each financing type. The expected return acts as a benchmark for evaluating profitability and performance across sectors, while the risk highlights the volatility experienced during this period.

TABLE II. RISK AND RETURN ANALYSIS OF THE CONSUMER PRODUCT SECTOR THROUGH THE GFC

Debt Financing				**Equity-based Financing**		
Expected Return = 1%, Risk = 3%				Expected Return = 1%, Risk = 3%		
Year	**Annual Return**	**Return to**		**Annual Return**	**Return to**	
		I	**C**		**I**	**C**
1	13900	50000	-36155	8500	5933	2543
2	20800	50000	-29181	13700	9578	4105
3	10500	50000	-39509	18300	12809	5490
4	30800	50000	-19245	20100	14075	6032
5	15300	50000	-34745	7600	5315	2278
6	9600	50000	-40363	11300	7916	3393
7	8700	50000	-41332	6900	4829	2070
8	14600	50000	-35404	12000	8415	3607
9	9100	50000	-40919	14800	10395	4455
10	12700	50000	-37298	14900	10438	4474
11	20600	50000	-29372	12000	8428	3612
12	8800	50000	-41157	9700	6778	2905
	Frequency of Negative Return		100%	**Frequency of Negative Return**		100%
	Frequency of Negative NPV		0%	**Frequency of Negative NPV**		100%
	Frequency of Default Exposure		100%	**Frequency of Default Exposure**		0%

TABLE III. RISK AND RETURN ANALYSIS OF THE INDUSTRIAL PRODUCT SECTOR THROUGH THE GFC

Debt Financing				**Equity-based Financing**		
Expected Return = 1%, Risk = 4%				Expected Return = 1%, Risk = 4%		
Year	**Annual Return**	**Return to**		**Annual Return**	**Return to**	
		I	**C**		**I**	**C**
1	26800	50000	-23174	16900	11818	5065
2	6200	50000	-43752	23800	16650	7136
3	10200	50000	-39830	30700	21483	9207
4	15500	50000	-34526	22400	15660	6711
5	25600	50000	-24355	22700	15907	6817
6	18300	50000	-31710	12700	8886	3808
7	8200	50000	-41800	9900	6908	2961
8	15200	50000	-34765	12600	8789	3767
9	17000	50000	-32955	21300	14915	6392
10	21700	50000	-28268	18900	13233	5671
11	15500	50000	-34529	17300	12125	5197
12	9000	50000	-41032	16200	11317	4850
	Frequency of Negative Return		100%	**Frequency of Negative Return**		100%
	Frequency of Negative NPV		0%	**Frequency of Negative NPV**		100%
	Frequency of Default Exposure		100%	**Frequency of Default Exposure**		0%

TABLE IV. RISK AND RETURN ANALYSIS OF THE HEALTHCARE SECTOR THROUGH THE GFC

Debt Financing				**Equity-based Financing**		
Expected Return = 1%, Risk = 6%				Expected Return = 1%, Risk = 6%		
Year	**Annual Return**	**Return to**		**Annual Return**	**Return to**	
		I	**C**		**I**	**C**
1	30400	50000	-19594	25900	18110	7761
2	31600	50000	-18389	15300	10731	4599
3	24700	50000	-25325	33700	23586	10108
4	25300	50000	-24685	10100	7086	3037
5	17700	50000	-32342	23700	16557	7096
6	32700	50000	-17304	37400	26180	11220
7	33600	50000	-16428	22400	15701	6729
8	19200	50000	-30833	18300	12827	5497
9	27300	50000	-22721	18700	13120	5623
10	28300	50000	-21691	21300	14892	6382
11	40100	50000	-9918	28600	20016	8578
12	14300	50000	-35705	22800	15967	6843
	Frequency of Negative Return		100%	**Frequency of Negative Return**		100%
	Frequency of Negative NPV		0%	**Frequency of Negative NPV**		99%
	Frequency of Default Exposure		100%	**Frequency of Default Exposure**		0%

TABLE V . RISK AND RETURN ANALYSIS OF THE TECHNOLOGY SECTOR THROUGH THE GFC

Debt Financing				**Equity-based Financing**		
Expected Return = 0.29%, Risk = 7%				Expected Return = 0.29%, Risk = 7%		
Year	**Annual Return**	**Return to**		**Annual Return**	**Return to**	
		I	**C**		**I**	**C**
1	32800	50000	-17169	10400	7310	3133
2	19000	50000	-31041	30000	21013	9005
3	17900	50000	-32128	28100	19677	8433
4	12700	50000	-37339	25400	17772	7617
5	15900	50000	-34080	29500	20644	8847
6	25000	50000	-24969	30700	21505	9217
7	23200	50000	-26828	21600	15092	6468
8	34300	50000	-15733	21000	14725	6311
9	38700	50000	-11346	25400	17787	7623
10	28500	50000	-21493	19400	13602	5829
11	20800	50000	-29174	27100	18984	8136
12	40900	50000	-9112	14400	10081	4320
	Frequency of Negative Return		100%	**Frequency of Negative Return**		100%
	Frequency of Negative NPV		0%	**Frequency of Negative NPV**		99%
	Frequency of Default Exposure		100%	**Frequency of Default Exposure**		0%

Based on Tables II-V above, the four sectors exhibited a high frequency of negative returns for both debt and equity-based financing. In the case of debt financing, companies are required to make fixed payments of RM50,000 to investors, regardless of project performance. Even when projects generate negative returns, companies remain obligated to meet these fixed payments due to the contractual nature of interest payments associated with debt. Consequently, any surplus profits from the project can only be retained by the companies by fulfilling their obligations to investors. This highlights a critical dynamic, companies must prioritize their financial responsibilities to investors before realizing any benefits, which contributes to the high frequency of negative returns observed. During the GFC, the risk and return analysis of these four sectors revealed a higher frequency of negative returns. This was primarily due to the severe economic downturn, which exacerbated financial pressures and further diminished project profitability in these sectors.

Based on the analysis, equity-based financing exposes companies to a high frequency of negative returns, primarily due to underperformance and the effects of major events such as the GFC. Despite this, equity-based financing offers flexibility in its return structure, enabling companies to reduce or withhold payments to investors during periods of poor performance [43]. In contrast, debt financing exhibits a significantly lower frequency of negative net present value (NPV) outcomes compared to equity-based financing. This is because debt financing guarantees fixed returns to investors, irrespective of a project's profitability. On the other hand, equity-based financing's flexible return model means investors do not receive payouts when a project fails to generate positive returns.

Debt financing exhibits a notably higher frequency of default risk compared to equity-based financing. Companies operating in these four sectors are generating lower returns, reflecting diminished expected profitability. Despite this, they remain obligated to meet fixed repayment commitments to investors, which significantly heightens their default risk when relying on debt financing [13]. The high default frequency and vulnerability to economic crisis highlight the substantial credit risk faced by these companies, undermining their long-term sustainability. These findings are consistent with the observations of [2], who emphasized that credit risk posed a severe challenge to financial institutions during the GFC. Furthermore, it was noted that elevated default exposure erodes a company's value and hampers its overall performance.

Equity-based financing exhibits a lower default frequency due to its inherent flexibility in returns, allowing companies to maintain financial stability even in challenging conditions. This flexibility reduces credit risk, as returns are directly aligned with the company's performance [13]. The consistently low default rates observed across all sectors during the GFC underscore the advantages of equity-based financing as a stabilizing tool in times of economic uncertainty. Consequently, equity-based financing emerges as a preferable option over debt financing for maintaining stability during crises, even though it may offer comparatively lower immediate performance. Moreover, companies that prioritize equity-based financing during economic downturns can better secure long-term sustainability for their operations and investments. This conclusion aligns with the findings of [8], which revealed that companies with higher equity-based issuance experienced greater investments and improved returns on capital during the GFC and the European debt crisis. Conversely, companies with higher debt levels were more prone to challenges such as debt overhang, which hindered their financial flexibility and growth prospects.

B. The phase of involving COVID-19 (2010-2021)

Tables VI - IX provide an extended analysis of the risk and return dynamics associated with debt and equity-based financing during the COVID-19 pandemic. The findings highlight sector-specific variations in expected returns, underscoring the diverse performance trends across industries during this period. Additionally, the analysis reveals varying levels of risk, emphasizing the distinct volatility characteristics of each sector.

Based on Tables VI-IX above, both debt and equity-based financing exhibited a high frequency of negative returns across all sectors, likely due to the low expected returns associated with the projects. This trend may be attributed to the severe impact of the COVID-19 pandemic on businesses [3]. Notably, this observation aligns with patterns seen during the GFC phase. However, the Technology sector stands out with higher expected returns compared to the other sectors, indicating better performance during this period.

Consistent with the findings from the GFC phase, debt financing demonstrated a lower frequency of negative NPV than equity-based financing. This can be explained by the fixed returns guaranteed to debt investors, regardless of a company's performance. In contrast, equity-based financing which characterized by flexible returns often led to a higher frequency of negative NPV. This suggests that when companies report negative returns, equity-based investors are more likely to face non-repayment risks.

TABLE VI . RISK AND RETURN ANALYSIS OF THE CONSUMER PRODUCT SECTOR THROUGH THE COVID-19

Debt Financing				**Equity-based Financing**		
Expected Return = 0.41%, Risk = 3%				Expected Return = 0.41%, Risk = 3%		
Year	**Annual Return**	**Return to**		**Annual Return**	**Return to**	
		I	**C**		**I**	**C**
1	20100	50000	-29896	14400	10062	4312
2	13700	50000	-36319	15600	10913	4677
3	14800	50000	-35244	15900	11131	4770
4	22000	50000	-27952	15100	10554	4523
5	8800	50000	-41207	11000	7707	3303
6	10700	50000	-39290	12900	9060	3883
7	10200	50000	-39822	18000	12626	5411
8	16800	50000	-33198	9000	6283	2693
9	25100	50000	-24917	21700	15199	6514
10	17000	50000	-32965	18700	13110	5619
11	16100	50000	-33919	12400	8688	3724
12	5000	50000	-45038	14700	10302	4415
	Frequency of Negative Return		100%	**Frequency of Negative Return**		100%
	Frequency of Negative NPV		0%	**Frequency of Negative NPV**		100%
	Frequency of Default Exposure		100%	**Frequency of Default Exposure**		0%

TABLE VII. RISK AND RETURN ANALYSIS OF THE INDUSTRIAL PRODUCT SECTOR THROUGH THE COVID-19

Debt Financing				**Equity-based Financing**		
Expected Return = 1%, Risk = 5%				Expected Return = 1%, Risk = 5%		
Year	**Annual Return**	**Return to**		**Annual Return**	**Return to**	
		I	**C**		**I**	**C**
1	12500	50000	-37519	7900	5503	2358
2	19700	50000	-30297	22500	15761	6755
3	20400	50000	-29593	17800	12494	5355
4	16500	50000	-33515	11000	7683	3293
5	14000	50000	-35958	29300	20475	8775
6	22900	50000	-27085	22700	15883	6807
7	15800	50000	-34241	26600	18604	7973
8	33400	50000	-16582	4900	3449	1478
9	30800	50000	-19178	26800	18781	8049
10	18200	50000	-31767	8700	6078	2605
11	23900	50000	-26050	29200	20465	8771
12	5900	50000	-44053	27800	19444	8333
	Frequency of Negative Return		100%	**Frequency of Negative Return**		100%
	Frequency of Negative NPV		0%	**Frequency of Negative NPV**		100%
	Frequency of Default Exposure		100%	**Frequency of Default Exposure**		0%

TABLE VIII. RISK AND RETURN ANALYSIS OF THE HEALTHCARE SECTOR THROUGH THE COVID-19

Debt Financing				**Equity-based Financing**		
Expected Return = 1%, Risk = 6%				Expected Return = 1%, Risk = 6%		
Year	**Annual Return**	**Return to**		**Annual Return**	**Return to**	
		I	**C**		**I**	**C**
1	34200	50000	-15776	16200	11326	4854
2	22600	50000	-27388	14900	10397	4456
3	29900	50000	-20148	22900	16030	6870
4	26200	50000	-23797	37400	26205	11231
5	40300	50000	-9652	21700	15224	6525
6	26100	50000	-23901	27000	18927	8112
7	33800	50000	-16171	36600	25633	10986
8	23000	50000	-27047	2400	1671	716
9	25700	50000	-24324	30300	21210	9090
10	19100	50000	-30944	30100	21093	9040
11	25400	50000	-24610	22600	15819	6780
12	38800	50000	-11173	25900	18115	7763
	Frequency of Negative Return		100%	**Frequency of Negative Return**		100%
	Frequency of Negative NPV		0%	**Frequency of Negative NPV**		99%
	Frequency of Default Exposure		100%	**Frequency of Default Exposure**		0%

TABLE IX. RISK AND RETURN ANALYSIS OF THE TECHNOLOGY SECTOR THROUGH THE COVID-19

Debt Financing				**Equity-based Financing**		
Expected Return = 2%, Risk = 9%				Expected Return = 2%, Risk = 9%		
Year	**Annual Return**	**Return to**		**Annual Return**	**Return to**	
		I	**C**		**I**	**C**
1	36900	50000	-13112	43000	30131	12913
2	40300	50000	-9732	27700	19369	8301
3	27300	50000	-22740	24800	17369	7444
4	10300	50000	-39699	29000	20317	8707
5	40100	50000	-9919	13400	9409	4032
6	27600	50000	-22426	31100	21777	9333
7	29900	50000	-20146	41800	29289	12552
8	19900	50000	-30139	24000	16810	7204
9	11200	50000	-38774	14400	10079	4319
10	23400	50000	-26571	23200	16245	6962
11	28200	50000	-21831	34500	24118	10336
12	12600	50000	-37379	16400	11506	4931
	Frequency of Negative Return		100%	**Frequency of Negative Return**		100%
	Frequency of Negative NPV		0%	**Frequency of Negative NPV**		61%
	Frequency of Default Exposure		100%	**Frequency of Default Exposure**		0%

While a negative NPV in equity-based financing may initially appear unfavourable, companies can perceive it as advantageous because they are not obligated to deliver returns to investors during periods when the project fails to generate positive cash flows [11]. This flexibility allows businesses to allocate the remaining funds towards sustaining future operations and pursuing opportunities that can drive additional profitability and, ultimately create value for their investors [33]. This study asserts that, regardless of the financing method employed, a company must achieve higher levels of profitability and operational performance while maintaining an equivalent risk profile to ensure the generation of positive returns. In addition, the Technology sector showed a relatively lower frequency of negative NPV when equity-based was used, compared to the other sectors. This highlights the sector's ability to deliver better returns to investors through both debt and equity-based financing, outperforming the other sectors during this challenging phase.

Similar to the period surrounding the GFC, equity-based financing during the COVID-19 phase exhibited a notably lower frequency of default exposure across all sectors compared to debt financing. This finding highlights a key advantage for corporations and investors who value entrepreneurship and resilience. Throughout simulations in both periods, equity-based financing consistently demonstrated stability in returns, with default exposure remaining negligible. If such dynamics were replicated in real-world scenarios, this characteristic could have a transformative impact on the aggregate economy, not just at the sectoral level by fostering greater systemic resilience. Furthermore, the low frequency of default exposure reinforces the argument that equity-based financing mitigates risks within individual sectors and reduces broader systemic risks, contributing to a more stable economic environment.

This finding underscores the reliability of equity-based as a financing instrument, regardless of the varying risks and returns associated with companies across economic crises. In contrast, the high frequency of defaults in debt financing arises from the obligation to provide fixed returns to investors, even when companies experience significant negative returns or incur a highly negative NPV from their projects. This observation aligns with the findings of [18], which highlight that a high likelihood of default significantly increases credit risk exposure. When companies default, they often face substantial challenges in sustaining their business operations over the long term. Hence, companies should minimize their reliance on debt and maximize the use of equity-based financing structures.

V. CONCLUSIONS

This study provides empirical evidence that reliance on debt financing significantly increases the likelihood of default and credit risk. The GFC of 2007-2008 underscored the fragility of economies heavily reliant on debt, as excessive borrowing emerged as a primary driver of economic vulnerability. Despite numerous alternative financing methods proposed in the literature, global debt levels remain persistently high. Elevated debt burdens pose substantial risks to borrowers, as they entail the repayment of principal amounts and compounding interest obligations (payments that must be met irrespective of business performance). This financial strain heightens borrowers' exposure to credit risk, particularly when they struggle to meet their obligations due to the rising cost of borrowing. In addressing the widespread dependence on debt financing, this study seeks to bridge the research gap by advocating for equity-based financing as a viable and potentially superior alternative within the financial system. By comparing the credit risk profiles associated with debt and equity-based financing across various sectors in Malaysia, the study highlights the advantages of equity-based financing in mitigating credit risk and fostering long-term financial sustainability for businesses.

Based on the risk and return analysis conducted, this study found that equity-based financing consistently met expectations by demonstrating low default exposure across various sectors. Moreover, the findings revealed that equity-based financing enables companies to weather financial shocks effectively, as it maintains minimal credit risk exposure even during significant economic downturns, such as the GFC and the COVID-19 pandemic. By leveraging equity-based financing, companies can achieve financial sustainability, ensuring operational continuity and maximizing returns for investors, regardless of individual projects' risk and return profile. The simulation results further emphasized equity-based financing as the most reliable and resilient alternative to debt, highlighting its capacity to mitigate credit risk exposure.

These findings offer valuable insights for comparing the credit risk dynamics of debt and equity-based financing. Additionally, this study underscores the need for further empirical research into technological advancements in equity-based financing, which could deepen the understanding and appreciation of this alternative method. By fostering such innovations, market participants can be more encouraged to prioritize equity-based financing over an exclusive reliance on debt, thereby promoting a more balanced and sustainable financial strategy.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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